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ABSTRACT

This report presents findings from the third of a series of studies of the Upward Bound (UB) program. The study was conducted between April, 1978, and September, 1979, to investigate long-term educational outcomes of UB program participation. The Upward Bound program was designed for low income high school students with potential for successfully completing a postsecondary program but who do not meet the conventional criteria for admission to such programs. Data were collected through a mail survey questionnaire, telephone interviews, and student transcripts. The UB program was found to have an impact on educational aspirations, postsecondary education (PSE) progress, and persistence. Impact appears to be related to participation patterns of former participants: those with typical participation patterns generally exhibited more positive outcomes than those with atypical patterns. A comparison of the patterns of educational progress for typical UB participants and nonparticipants indicates that the greater overall progress of participants is attributable to their greater rates of entry to PSE and to their propensity to attend four year institutions. The progress rates of UB participants and nonparticipants in two year institutions were not significantly different with the exception of graduation rates. It can be concluded that the UB program is effectively meeting its mandated objective to provide participants with the skills and motivation necessary for entry and success in education beyond high school. Summaries of previous evaluative studies and data collection and analysis techniques are appended. (Author/MK)

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FINAL REPORT

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EVALUATION STUDY OF THE UPWARD BOUND PROGRAM:

A SECOND FOLLOW-UP

by

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U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
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PREFACE AND ACKNOWLEDGEMENTS

This document, Evaluation Study of the Upward Bound Program: A Second Follow-up, represents the final report of research conducted by the Research Triangle Institute (RTI) under U.S. Office of Education (USOE) contract number HEW-300-78-0037. The main body of the report, an executive summary, and supporting technical appendixes are bound in one volume.

This report was prepared to describe the second follow-up study and results for both the technical and nontechnical reader. The material provided in the body of the report is general and, to the extent possible, nontechnical in nature; the more technical material and details are presented in appendixes. For most readers, the textual presentation should suffice in describing the study design and important results. The more critical reader is referred to appendixes and cited external publications for greater detail.

There are many people, both within and outside RTI, to whom the authors are indebted, for making possible the completion of this report and of the second follow-up survey on which the report focuses. The study owes its very existence, of course, to the cooperation of the directors and staffs of the 54 sample Upward Bound (UB) projects and of the more than 6,000 student sample members who were selected for participation in the initial base-year survey. Additional gratitude is due to the thousands of respondents to the second follow-up survey, without whose continued cooperation and interest the present study would not have been possible.

At the U.S. Office of Education, Dr. C. Dennis Carroll of the Office of Evaluation and Dissemination (OED) provided considerable input as technical project officer for the second follow-up study. Dr. Carroll's knowledge of the technical and operational aspects of survey design and analysis contributed greatly to the successful conduct of this research effort.

The authors are also grateful to the members of the Internal DHEW Review Committee for this study: Ms. Velma Montero, Division of Student Services and Veterans Programs (DSSVP); Dr. Kate Avery, Office of the Assistant Secretary of Education (ASE); Dr. Monte Perez, ASE; Dr. Jim Herbert, Office of the Assistant Secretary for Planning and Evaluation (ASPE); Dr. John Rison Jones, Jr., Bureau of Higher and Continuing Education (BHCE); and Ms. Shelley Laverty, BHCE. Special thanks go to Dr. Jones and Ms. Montero for their continued cooperation and valuable advice and assistance throughout the study.

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At RTI, particular thanks go to Ms. Jean Richardson, Mr. Chris Myers, and Ms. Barbara Elliott, for their tireless and consistently excellent support throughout the course of this study. Ms. Richardson, senior programmer, contributed enormously to all phases of project operation--planning, data collection, receipt control, file construction, and analysis. Mr. Myers, survey assistant, played an essential role in all aspects of data collection and pre-machine data processing. Ms. Elliott was indispensable as project secretary, and contributed to the success of this study in ways too numerous to mention.

Other persons from various departments at RTI also deserve recognition for their substantive contributions to the sampling, data collection, data processing, data analysis, and/or report preparation activities of the second follow-up study. Ms. Jilene Weber and Dr. Ralph Folsom were responsible for sample selection and related activities; Mr. Mike Weeks directed the data collection and data entry operations; Mr. Tom Novak and Mr. Art French contributed to analysis software development and data tape preparation; Ms. Mary Ellen Taylor supervised the manual coding of student transcripts; and Dr. Edward Fuentes, Mr. Phil Piserchia, and Mr. Vijaya Rao contributed to the analysis planning.

Special thanks also go to Dr. J. A. Davis and Dr. George Dunteman for their critical review of earlier report drafts, and to Ms. Linda Shaver, Ms. Susan Jones, Ms. Celestine Smith, and Ms. Pam Rigsbee for assisting Ms. Elliott with the typing and re-typing of this manuscript. Finally, the authors wish to express their thanks to the many others in RTI's data services, graphic arts, and report reproduction departments who have not been mentioned by name because of space limitations, but whose contributions to the success of the study and/or production of this report are nevertheless appreciated.

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Executive Summary

Evaluation Study of the Upward Bound Program: A Second Follow-Up

I. BACKGROUND AND PURPOSE

Under authority of the Economic Opportunity Act of 1964, as amended (42 U.S.C. 2809), the Office of Economic Opportunity (OEO) funded 17 Upward Bound (UB) projects as a pilot program in the summer of 1965. In 1966, UB was authorized as a national program under Title II.A of the Economic Opportunity Act. In 1969, the UB program was transferred from OEO to the U.S. Office of Education (USOE), Department of Health, Education, and Welfare. The present legislative authority is Section 408 of the Higher Education Act of 1965, as amended.

The program was designed for low-income high school students with potential for successfully completing a postsecondary program, but who, due to inadequate preparation and/or lack of motivation, do not meet conventional criteria for admission to a postsecondary program. Through various intervention strategies (e.g., remedial instruction, exposure to new or altered curricula, tutoring, cultural enrichment activities, counseling, and encouragement), the program is designed to generate in participants the skills and motivation necessary to enter and successfully complete postsecondary education (PSE). During the summer, UB participants typically reside on a postsecondary campus for an intensive six- to eight-week session. In the academic year, they typically receive less intensive attention. During their junior and senior years of high school, participants receive guidance in exploring options for PSE preparation.

In July 1973, USOE contracted with Research Triangle Institute (RTI) to conduct an evaluation of the UB program. This base-year study provided a comprehensive description of the UB program as it existed in program year 1973-74, investigated the relationships of UB participation to short-term educational outcomes, and examined the relative effectiveness of different types of UB projects in respect to these outcomes. A first follow-up (FFU) study was conducted between October 1976 and September 1977. The FFU study examined educational progress and persistence as related to extent of prior participation in the UB program, and investigated student educational expectations and problems experienced through that time for base-year sample members.

The present, second follow-up (SFU), study was conducted between April 1978 and September 1979 to investigate long-term educational outcomes, concentrating on the PSE experience, that were not fully addressed in the previous studies. Particular emphasis was placed on investigating PSE persistence, progress, and performance as related to prior UB program participation pattern; however, other relevant educational outcomes (e.g., receipt of financial aid, use of support services) and educational deterrents were also examined.

II. DESIGN AND METHODOLOGY

The design of the SFU study was necessarily constrained by the base-year design. From the 333 regular UB projects operating in coterminous United States during the 1973-74 program year, 54 were selected after stratification on student ethnicity, number of students served, project location, type of project, and type of host institution. All participants in grades 10, 11, or 12 of sampled projects were selected, yielding 3,710 UB participants in the final sample. An average of two high schools providing students to sampled UB project were selected. From a sample of classrooms in these schools, 2,340 nonparticipating comparison students were selected, after stratification on grade level, ethnicity, low-income status, and academic risk.

SFU data were collected in two stages during the 1978-79 academic year. The first stage was a mail survey of eligible sample members during fall and winter, followed by telephone interviews of a subsample of mail nonrespondents. The second stage was a spring mail request of transcripts from PSE institutions last attended by questionnaire respondents. Other data were obtained from base-year and FFU files, a PSE institutional data file, and USOE records. Overall study response rate was 73 percent; effective sample coverage was 88 percent; and 87 percent of the transcript requests were honored. The extent of data indeterminacy and inconsistency was small, and estimated data reliability was acceptable.

Two different approaches to analysis were undertaken, both differing from techniques employed in previous studies. The first was a hypothesis-testing approach, addressing questions of national program impact by comparing outcomes of former UB participant groups with those of a statistically adjusted nonparticipant group. The second approach, which is characterized as relational, was exploratory and more assumption-bound. Modeling techniques were employed to examine selected educational outcomes as related to individual background factors, temporal/contextual factors, and pattern of UB participation.

III. FINDINGS

The findings of the three studies are consistent in suggesting UB program impact on educational aspirations or expectations, PSE progress and persistence. Moreover, the indicated program impact seems to be focused at the transition step between high school completion and postsecondary entry. There was no clear indication of program effect on high school completion, although overall rates are high. Further, progress/persistence, subsequent to entering PSE, reflect the higher rate of entry or the influence of PSE context factors (which differed for program participants and nonparticipants) more than any influence attributable uniquely to UB participation.

Suggested program impact is also related to pattern of former participation in UB. Individuals with typical participation patterns (i.e., participation in grades 11 and 12 or grades 10, 11, and 12) generally exhibited more positive outcomes than those with atypical participation patterns, for whom outcomes more closely resembled the nonparticipant group. An exception involved those participating only in the twelfth grade, for whom outcomes were generally more like those of typical participants than of other atypical participant groups.

The educational progress of typical UB participants and nonparticipants is presented in Figure 1. The values reported are composites from results for those in the twelfth-grade cohort, who were over four years removed from high school. The values in parentheses between boxes are the conditional rates of advancing to a subsequent educational level, given attainment of a previous level. The values in brackets within boxes are the percentages of the original group attaining each educational level. While neither group exhibits normal educational progress, the greater overall progress of typical participants is primarily attributable to the greater rates at which they enter PSE and to their greater propensity to attend four-year institutions. In general, other differences between these groups in conditional rates of progress are not significant. Similar patterns were observed for the tenth and eleventh grade cohorts, although overall progress was generally less. (Although not shown in Figure 1, within both groups, 10 percent of those who graduated from a four-year institution had entered postgraduate training.)

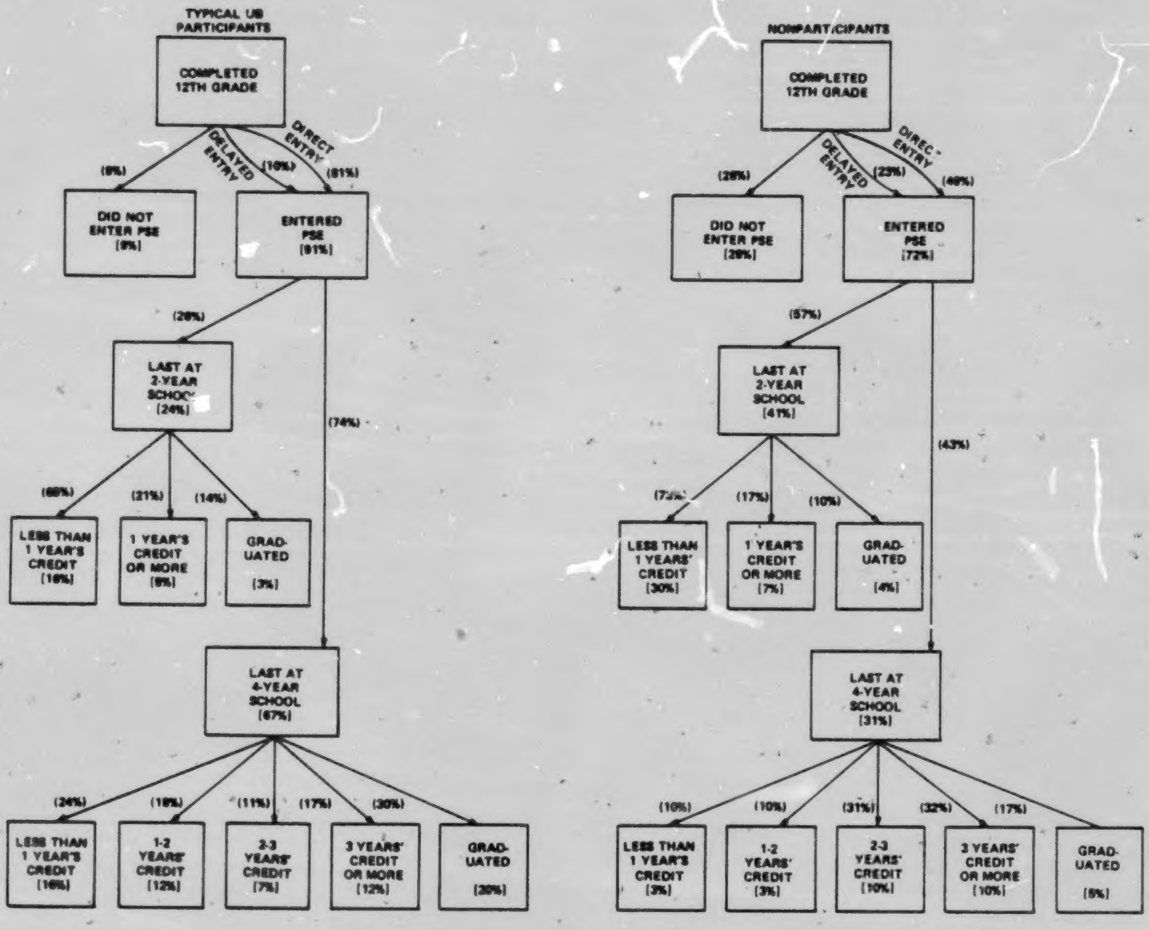
TYPICAL UB PARTICIPANTS
COMPLETED 12TH GRADE
DELAYED ENTRY
DIRECT ENTRY
(9%)
(10%)
(81%)
DID NOT ENTER PSE [9%]
ENTERED PSE [91%]
(26%)
(74%)
LAST AT 2-YEAR SCHOOL [24%]
(65%)
(21%)
(14%)
LESS THAN 1 YEAR'S CREDIT [16%]
1 YEAR'S CREDIT OR MORE [5%]
GRAD-UATED [3%]
LAST AT 4-YEAR SCHOOL [67%]
(24%)
(18%)
(11%)
(17%)
(30%)
LESS THAN 1 YEAR'S CREDIT [16%]
1-2 YEARS' CREDIT [12%]
2-3 YEARS' CREDIT [7%]
3 YEARS' CREDIT OR MORE [12%]
GRAD-UATED [20%]
NONPARTICIPANTS
COMPLETED 12TH GRADE
DELAYED ENTRY
DIREC-ENTRY
(28%)
(23%)
(49%)
DID NOT ENTER PSE [28%]
ENTERED PSE [72%]
(57%)
(43%)
LAST AT 2-YEAR SCHOOL [41%]
(73%)
(17%)
(10%)
LESS THAN 1 YEARS' CREDIT [30%]
1 YEAR'S CREDIT OR MORE [7%]
GRAD-UATED [4%]
LAST AT 4-YEAR SCHOOL [31%]
(10%)
(10%)
(31%)
(32%)
(17%)
LESS THAN 1 YEAR'S CREDIT [3%]
1-2 YEARS' CREDIT [3%]
2-3 YEARS' CREDIT [10%]
3 YEARS' CREDIT OR MORE [10%]
GRAD-UATED [5%]

Figure 1. Educational progress of typical UB participants and nonparticipants.

Figure 2 also shows that typical UB participants enter four-year institutions at considerably higher rates than either atypical participants or nonparticipants. Typical participants also show greater attendance at institutions with traditional or predominant ethnic minority student bodies, more selective institutions, and institutions hosting UB and SSDS programs, which is consistent with prior findings.

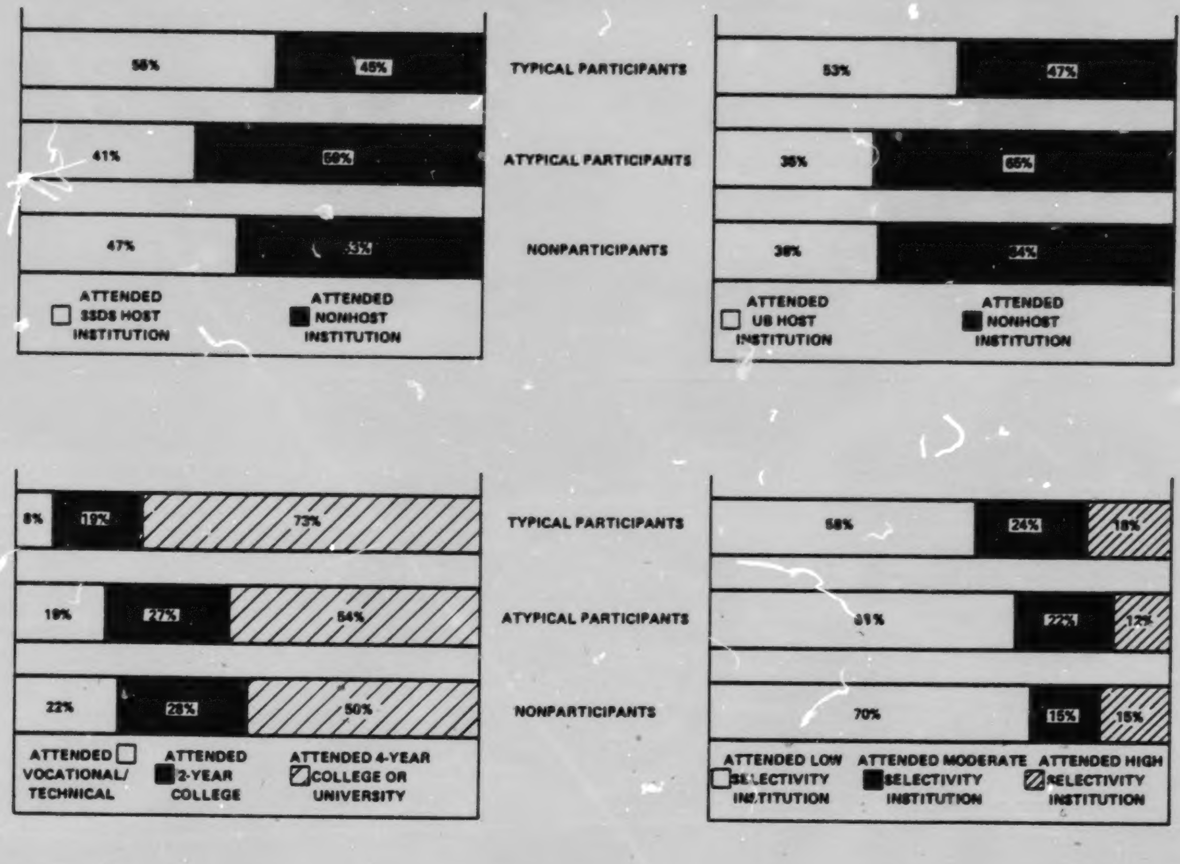

Figure 2. Types of PSE Institutions Attended as Related to Participation Pattern.

Over 80 percent of the typical UB participants aspired to at least a four-year college degree, but less than two-thirds of the atypical participants or nonparticipants reported such aspirations. Over 70 percent of the typical participants expected to complete a four-year program, compared to 60 percent of the atypical participants and 50 percent of the nonparticipants. These differences were principally attributable to greater percentages of typical participants aspiring to and expecting postgraduate study. UB participants also reported experiencing somewhat more difficulty than nonparticipants in obtaining their desired education level, including more problems with poor grades, poor high school preparation, and lack of personal or family finances. Similar results were obtained in the FFU study.

In view of the higher aspirations of typical UB participants, progress was examined relative to educational goals. The goal-related progress of typical participants was also greater than that of either atypical participants or nonparticipants. Within the twelfth-grade cohort typical participants had progressed, on the average, over half way toward their goals, while those in the other two groups showed significantly less progress. Progress toward goal was generally lower for the eleventh and tenth grade cohorts, but the differences between participation pattern groups remained stable. Differences in goal-related progress were also attributable to the different PSE entry rates and types of institution attended.

No systematic differences were observed between former participants and nonparticipants on measures of PSE persistence. No differences in graduation rates were found within either vocational/technical schools, two-year colleges, or four-year institutions, although differences between different types of schools existed. About 70 percent of those who last attended vocational/technical schools or four-year institutions and about 50 percent of those who last attended two-year colleges were either currently enrolled or had graduated. Less than 20 percent of each participation pattern group reported leaving without graduating and with no intent to return.

Similarly, measures of educational performance showed few differences as a function of UB participation. No systematic differences in rates of being academically dismissed or placed on academic probation were observed as related to either UB participation or kind of school last attended. UB participants had a lower overall grade point average (GPA) than nonparticipants at both vocational/technical schools and four-year institutions, by .6 and .2 respectively. The average GPA for UB participants was about 2.0 (equivalent to a letter grade of C) at both types of schools.

Principal among the other PSE outcomes examined was financial aid. Figure 3 shows the average aid received by typical participants, atypical participants, and nonparticipants during their last year of PSE. Typical participants generally received more aid than atypical participants or nonparticipants, due mainly to receipt of larger grants and scholarships. The figures reported are combined over all types of schools, but the pattern presented was relatively stable across school types. The pattern of financial aid packaging varied somewhat with student class. Freshman and sophomore aid packages contained more grants and scholarships, and the aid packages of UB participants were more heavily weighted in this direction than nonparticipant packages. Aid

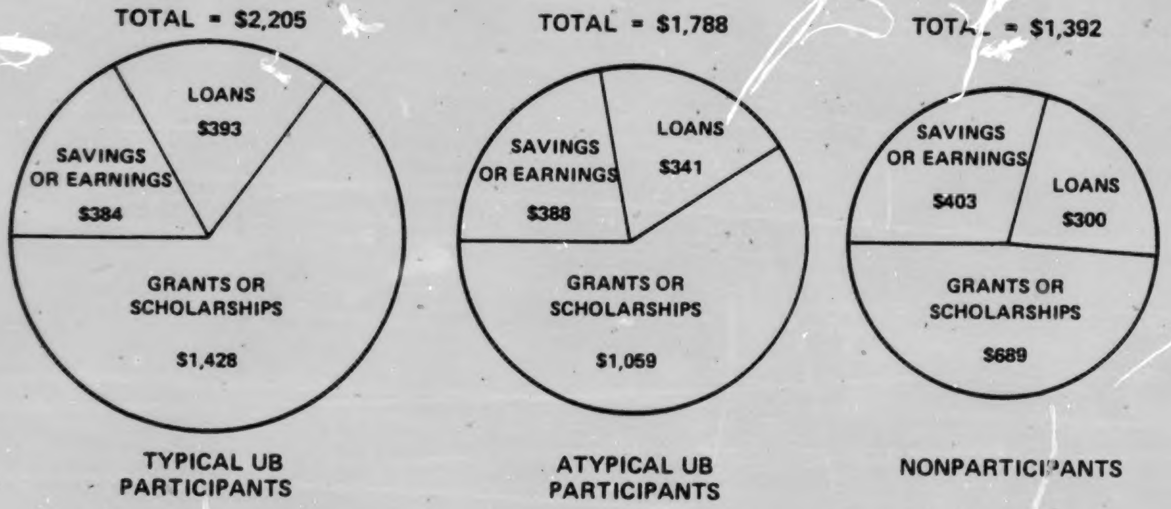

Figure 3. Financial Aid Received as Related to UB Participation Pattern.

packages for juniors and seniors contained more loans, with no difference in the proportional packaging of aid for participants and nonparticipants.

UB participants and nonparticipants also differed in the specific sources of financial aid. Typical participants (79 percent) received Basic Educational Opportunity Grants at higher rates than either atypical participants (70 percent) or nonparticipants (59 percent). Rates of receiving Supplemental Educational Opportunity Grants, National Direct Student Loans, and College Work-Study were also higher for participants (typical and atypical) than nonparticipants.

The greater financial aid received by former UB participants was reflected in a greater perceived adequacy of total financial aid package; however, this difference was only at schools with higher per-student costs. About two-thirds of each group at low-cost schools reported that support from the total aid package was adequate; at high-cost schools, the percentages were 76 and 59 for former participants and nonparticipants, respectively. Former participants reported inadequacy of family contributions at substantially higher rates than nonparticipants at each type of school, which is consistent with other findings.

UB participants also reported greater use of available tutoring services than nonparticipants. Available counseling services were used more frequently by UB participants only within SSDS host institutions. No differences were observed between the groups in use of available remedial services.

The educational model examined in this study is shown in Figure 4. The model posits PSE outcomes as related to UB participation pattern and background characteristics of the individual. Moreover, relational links are assumed between classes of PSE outcomes context factors (school classification), use of services, financial aid elements, and educational attainment measures. The "effects" of one class of variable on another class are indicated by directional paths. The overall relationship between two classes of variables is decomposed into paths that are direct (a path directly from one variable class to a subsequent class) or indirect (a path from one class of variables, through one or more intermediate classes, to a subsequent class).

In the model examined, all but one of the direct paths (the path labeled 0) represented statistically significant relationships. The major direct and indirect effects of typical UB participation pattern, as compared to nonparticipation, on educational attainment outcomes are shown as darker lines, and the numbers associated with these lines show the magnitude of the direct or indirect effects. Estimated model parameters are well supported by results of the more rigorous hypothesis-testing analyses. The model solution indicates no direct effect of typical UB participation on number of terms in PSE, but an overall increase of over a full term attended through the fact that typical participants attend different types of schools (.89 additional terms), make greater use of support services (.06 additional terms), and receive more financial aid (.13 additional terms). The residual negative direct effect of typical participation on total terms of earned credits is mediated, through indirect effects, to an overall advantage of approximately two-thirds of a term's credit. The residual negative relationship to GPA is also partially offset by indirect effects.

These results should be interpreted with some caution, due to the large number of assumptions made. While the model is convenient in explaining the

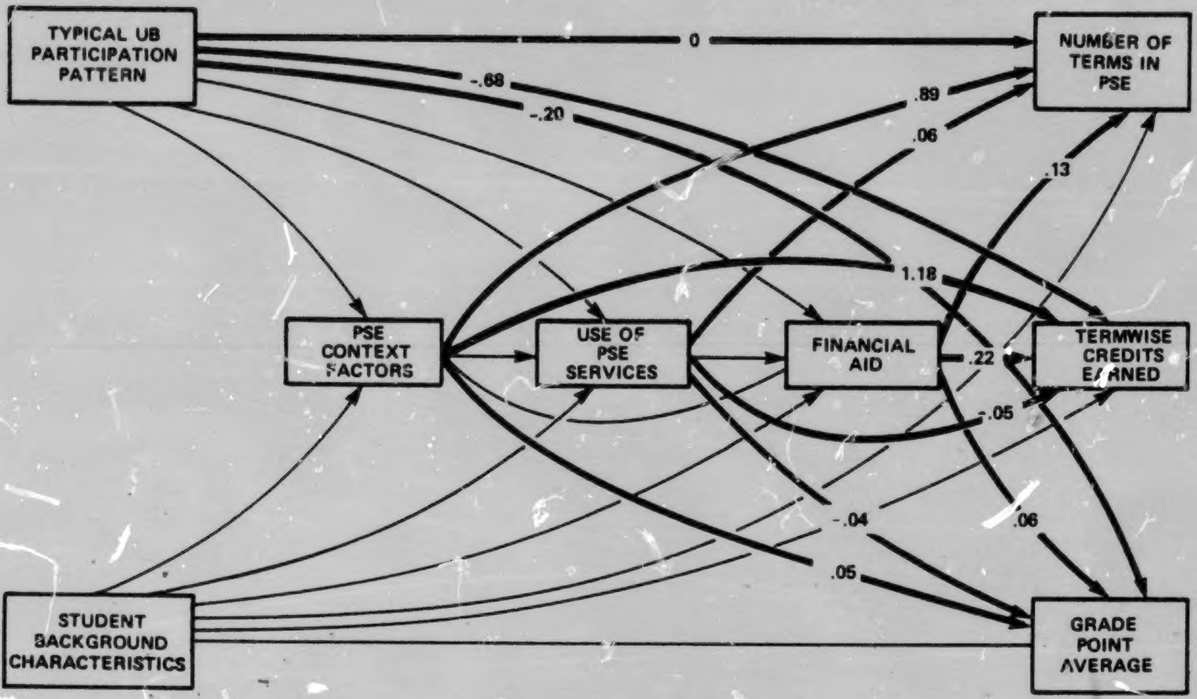
TYPICAL UB PARTICIPATION PATTERN
NUMBER OF TERMS IN PSE
PSE CONTEXT FACTORS
USE OF PSE SERVICES
FINANCIAL AID
TERMWISE CREDITS EARNED
STUDENT BACKGROUND CHARACTERISTICS
GRADE POINT AVERAGE
0
-.68
-.20
.89
.06
.13
1.18
.22
.05
-.04
.06
.05

Figure 4. Conceptual Model of Educational Attainment.

data and may be appealing, there is some indication that the model is misspecified. There may be other models that could provide an equally good or better fit for the data. The effects indicated are not in any sense established by the model; rather, they are assumptions of the model.

[illegible] CONCLUSIONS

The results of this study, in conjunction with those of previous studies, offer rather consistent support for the general conclusion that the UB program is effectively meeting its mandated objective to provide participants with the skills and motivation necessary for entry and success in education beyond high school. Program impact is greatest on short-term outcomes, and evidence that UB is providing the skills, motivation, and assistance necessary for entry into PSE is substantial. While it is less clear that the program also provides the skills and motivation for success in PSE, there are several results to support the contention of an overall positive impact of UB participation on PSE success.

While it is impossible to state definitively that the greater aspirations, expectations, and PSE entry rates of UB participants were brought about (or caused) by their exposure to the program, this appears to be the most likely conclusion. The pattern of results is closely aligned with what would be expected in view of the common areas of program emphases and intervention strategies. The different outcomes for different patterns of program participation are also quite intuitive in light of program operations.

Almost all projects emphasize the importance of postsecondary entry and assist participants in applying for and gaining admission to some postsecondary institution, as well as in obtaining financial aid from that institution. It would be unusual if these efforts were not reflected in greater entry rates of participants and in their securing more attractive financial aid packages during the first years of PSE. Similarly, projects uniformly provide support and counseling to participants toward increasing self-confidence in their abilities and toward raising their educational sights. With these treatments and with the advantage realized in gaining postsecondary entry, greater aspirations and expectations of participants are also not surprising. Greater attendance by participants in four-year institutions, UB host institutions, and SSDS host institutions are also consistent with the implicit program placement emphases.

There is no indication that academic skills accrue in any greater extent by participation in UB, since change in high school GPA was not related to program participation (base year study), and no systematic relationship between UB participation and measures of PSE performance was indicated (SFU study). Given the limited instructional time available to projects, clear-cut impact on academic skills may be an unrealistic expectation. On the other hand, there are other coping or survival skills related to PSE success such as the facility to obtain more attractive and adequate financial aid packages, and the knowledge and use of available support services. The results suggest that such skills have been honed to a greater extent by UB participants.

There is no systematic indication that UB participants progress, persist, or perform any better than comparable nonparticipants, once they are in a specific PSE environment. These results may be somewhat misleading, since nonparticipants represent a group of survivors in the educational system who have not benefitted from the support provided to the former UB participants. Motivational factors related to this survival were not measured and statistical adjustments do not reflect such factors. While the legislative UB program objective clearly focuses on postsecondary success and while PSE progress, persistence, and performance are legitimate criteria for PSE success, projects are not afforded any direct strategies for intervention once a participant leaves the program to enter college. Additional follow-up intervention strategies within the entered PSE institution may be required to provide a sufficient set of conditions for success in PSE. Thus, measures of postsecondary success per se may not be appropriate or reasonable criteria for program evaluation.

Nonetheless, there is considerable evidence that placement of UB participants in particular PSE settings may lead indirectly to an overall advantage over PSE-entering nonparticipants. PSE placement of participants is a legitimate function of the UB program, and the differences in types of schools attended by former participants and nonparticipants suggest that many UB participants have been channeled into educational settings and challenges that they would have bypassed otherwise. Moreover, it is strongly suggested that substantial numbers of former UB participants enter PSE who would not have gone otherwise, and that a substantial percentage of these students will successfully complete a postsecondary program of study. Finally, it is reasonable to assume that, as a result, these young people will obtain better jobs and, in general, lead more productive and satisfying lives. Viewed from this broader perspective, an impact of the UB program is certainly indicated.

Chapter 1

Introduction

I. GENERAL

This document constitutes the final report of a second follow-up evaluation study of the national Upward Bound (UB) program. The UB program is funded by the U.S. Office of Education (USOE) to help selected low-income high school students with inadequate high school preparation and/or insufficient motivation to gain admission and experience success in postsecondary education (PSE). The current study, which is the third in a series of studies of the UB program, was supported by USOE (under contract number HEW-300-78-0037), and was conducted by the Research Triangle Institute (RTI).

The remaining sections of this chapter describe the UB program and earlier evaluation studies. Included is an overview of the base-year and first follow-up studies and major findings and a brief description of the nature and purpose of the second follow-up effort.

Chapter 2 deals with the methods and procedures employed in the second follow-up study. A general description of the basic study design, survey instrumentation and data sources, data collection and processing, data quality, analytic approaches, as well as the strengths and weaknesses of the methodology, are presented. Considerably greater detail regarding these aspects of the current study is provided in Appendixes A through G.

Hypothesis testing results, examining differential outcomes for former UB participants and a group of nonparticipants, are presented in Chapter 3. Charts and graphs are used to support those analytic results believed to be most informative; however, complete tabular presentations of all analyses are provided in Appendix H.

Chapter 4 presents results of a set of relational analyses. These analyses, while less rigorous than those reported in Chapter 3, examine the complex relationships among student background characteristics, temporal and contextual factors, pattern of UB participation, and student outcomes. Greater detail regarding these analyses is provided in Appendix I.

A summary of the survey findings, limitations, and conclusions is presented in Chapter 5.

II. BRIEF DESCRIPTION OF THE UPWARD BOUND PROGRAM

The UB program originated in the Office of Economic Opportunity (OEO) from 17 pilot demonstration projects that operated in the summer of 1965. In 1966, UB was authorized as a national program under Title II-A of the Economic Opportunity Act. In 1969, the UB program was transferred from OEO to USOE by authority of the Higher Education Amendments of 1968; present legislative authority is the Educational Amendments of 1976 (PL 94-482). The program is currently administered by the Division of Student Services and Veterans Programs (DSSVP), in the USOE Bureau of Higher and Continuing Education (BHCE).

UB was designed to reach low-income high school students who have potential for successfully completing an educational program but who, due to inadequate preparation and/or lack of motivation, are prevented from meeting conventional criteria for admission to a postsecondary educational program. Through the use of various intervention strategies (e.g., remedial instruction, exposure to new or altered curricula, tutoring, cultural activities, counseling, and encouragement), the program is legislatively mandated to generate in participants the skills and motivation necessary to enter and successfully complete postsecondary education (PSE).

During the summer, UB students typically reside on a college, university, or secondary school campus for an intensive six- to eight-week session, taking courses, attending cultural and social events, and receiving counseling. In the academic year, they usually receive less intensive attention; they may attend Saturday classes, attend periodic tutorial/counseling sessions, or participate in occasional cultural enrichment activities. During their junior and senior years of high school, they receive encouragement and guidance in exploring options in preparation for PSE in a program best suited to their needs, including assistance in preparing and submitting applications for admission and financial aid.

Institutions sponsoring UB projects are typically two- or four-year colleges or universities; in some cases, projects are sponsored by secondary schools or cooperating groups of institutions. The 1968 Higher Education Amendments required projects to establish cooperation between postsecondary institutions and secondary schools; to provide health services for program participants; to provide each student a stipend of no more than $30 per month; and to establish a maximum cost-per-student of $1,800 per year, with the

Federal share of expenditures limited to a maximum of 80 percent or $1,440 per student. The Education Amendments of 1972 removed these requirements, except for the ceiling on student stipends, and increased the Federal share of program funding to 100 percent.

During fiscal year 1973 (program year 1973-74), the year in which the national study was begun, there were 416 UB projects operating in the United States and its territories. The UB data bank and reporting system indicate that these projects served 51,755 individual participants[1] at a cost of $38.3 million during that period. The UB data system further reveals that, of the 416 projects, 67 were created specially for veterans (serving approximately 12,200 former servicemen) and 9 were special demonstration projects serving approximately 980 students in FY 1973. More recent figures indicate that in FY 1978 (program year 1977-78) there were a total of 345 UB projects serving 33,668 students at a total cost of about $41.5 million. Of these projects, 32 were veterans' projects (serving 5,845 participants) and 3 were special demonstration projects serving 1,367 students.

III. BACKGROUND

In July 1973, USOE contracted with RTI to conduct an evaluation of the UB program.[2] The study was needed for several reasons. Although other evaluation studies of UB had been undertaken, they had failed to meet some important needs of USOE. While USOE maintains an information system for current and former UB participants, this system was designed primarily for management operations.[3] Prior studies of the UB program were, in most cases, out-of-date. Even over the previous decade, there had been many relevant social, political, and economic changes that greatly affected not only the operation of the UB program but also the educational and vocational progress of young people in general. Moreover, the large majority of prior UB evaluation studies had examined the program at the project level rather than at the national level.[4]

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[1] Due to participant turnover and the overlapping of project year with fiscal year, the number of participants being served at a given point in time would be considerably less than this figure.

[2] The initial contract also included a national descriptive study of the Talent Search program.

[3] Standard available system software is focused on providing project-by-project or aggregate statistics (at various levels of aggregation), but this data source and the related software were neither intended nor designed to provide data to the extent required for a comprehensive evaluation.

The UB program was subjected to an investigation in 1969 by Greenleigh Associates, Inc., under contract to OEO.[5] This study did not meet the expressed needs of USOE at the time of the base-year study in that: (a) the evaluation had been conducted at an early point in the history of the program (substantial program changes had been made subsequently, including transfer from OEO to USOE, changes in legislation, formalization of new regulations, and regionalization of program direction); (b) it had not been possible to observe intermediate or long-term program effects toward retention of UB alumni in higher education; and (c) certain inadequacies existed in the control groups employed (i.e., older siblings of participants had been used as controls).

Another study of the UB program was conducted by the General Accounting Office (GAO).[6] Though limited in scope (both in the kind of data employed and in the number of projects examined), this study had raised serious questions as to the relative effectiveness of the UB program.

IV. THE BASE-YEAR STUDY

The primary goal of the base-year study was to evaluate two of the program's major objectives:[7] (1) to increase the high school completion rate of UB participants, and (2) to increase the rate of entry of UB participants into postsecondary institutions. The study also examined project characteristics in relation to attainment of program objectives. Evaluation of the attainment of skills and motivation necessary for success in PSE was adopted as a secondary goal of the study, primarily because of problems involved in determining and measuring the nature and degree of such skills and motivation. The study also provided a detailed description of the UB program, including characteristics of the staff and students, their perceptions of the program, and project operation and costs.

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[4] Davis, Junius A., and Kenyon, Cynthia A. Review of the Literature Relevant to the Upward Bound and Talent Search Programs (Volume I of A Study of the National Upward Bound and Talent Search Programs. Four Volumes). Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, April 1976.

[5] Greenleigh Associates, Inc. Upward Bound 1965-69: A History and Synthesis of Data on the Program in the Office of Economic Opportunity. New York: Greenleigh Associates, Inc., February 1970.

[6] Comptroller General of the United States. Problems of the Upward Bound Program in Preparing Disadvantaged Students for a Postsecondary Education. Washington, D.C.: U. S. Government Printing Office, March 1974 (ED 090-349).

[7] As determined from the mandated program objectives by the Study Advisory Panel.

In addition to previous evaluation studies, several other sources were consulted in designing the base-year study, including the enabling legislation, the program regulations, selected program personnel, current and former UB staff and students, and study advisory panels. The resultant study design, though essentially cross-sectional, employed a synthetic cohort approach and included both retrospective and short-range longitudinal data collection components.

Although funds were not available for a longitudinal effort when the base-year study was designed, the sample was selected to allow limited longitudinal follow-up (see Appendix C for additional detail). From the 333 regular UB projects operating in the coterminous United States during the 1973-74 program year,[8] 54 were selected after stratification on student ethnicity, number of students served, project location, type of project, and type of host institution. All participants in the sampled projects who were in grades 10, 11, or 12 were selected, yielding 3,710 UB participants in the final sample. An average of two high schools providing students to each selected UB project were chosen and, from a sample of classrooms in each of these schools, a total of 2,340 nonparticipating comparison students were selected after stratification on grade level, ethnicity, low-income status, and academic risk status. A sample of UB project staff including project directors from all 54 selected projects and a sample of 104 counselors and 211 instructors were also selected. In addition, 15 of the 54 sampled UB projects were selected for site visits.

A large number of instruments were used in collecting data from schools, projects, project staff, and students through questionnaire responses, personal interviews, and student records. From the diverse information collected, the base-year study provided a comprehensive description of the UB program as it existed in program year 1973-74, investigated the relationships of UB participation to short-term educational outcomes (e.g., high school completion and PSE entry), and examined the relative effectiveness of different types of UB projects in respect to these short-range outcomes.[9]

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[8] The 83 projects operating outside the coterminous United States and/or classified as special veterans' or demonstration projects were excluded.

V. THE FIRST FOLLOW-UP STUDY

The first follow-up study was funded by USOE and was conducted over a twelve-month period, from October 1976 through September 1977. First follow-up data were collected during the winter and early spring of 1977 from members of the base-year student sample, through a mail questionnaire survey and subsequent telephone interviews of a subsample of nonrespondents to the mailing.

The first follow-up study was conducted to obtain information about intermediate educational outcomes, particularly as related to the postsecondary experience, which could not be considered in the base-year study due to temporal limitations. The major focus of the first follow-up study was educational progress and persistence as related to extent of prior participation in the UB program, but the study also investigated student educational expectations, problems experienced in obtaining an education, and other student outcomes. The first follow-up also examined the relationships between certain educational outcomes and student characteristics (race, sex, poverty status, academic risk status), temporal factors (age and grade cohort), and contextual factors (specific project association), in addition to extent of UB participation.

The first follow-up study was limited in scope, and the information collected was minimal and related to the status of sample members at that point in time. Other data were obtained from existing sources: the base-year student master file, a PSE institutional data file, and USOE records. Even within the limitations of the first follow-up, the overall response rate was satisfactory (71 percent), and the data were statistically representative of the original sample. The extent of data indeterminacy was small; inconsistency within the data was generally within reasonable tolerance levels; and, data reliability was generally acceptable.[10]

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[9] Burkheimer, G. J., Levinsohn, J. R., Koo, H. P., and French, A. M. Evaluation Study of the Upward Bound Program (Volume IV of A Study of the National Upward Bound and Talent Search Programs. Four Volumes). Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, April 1976.

VI. MAJOR FINDINGS OF THE BASE-YEAR AND FIRST FOLLOW-UP STUDIES

The major student-related findings of the base-year and first follow-up studies include the following:[11]

- Former UB participants had substantially higher educational expectations than comparable nonparticipants.
- Although no systematic differences were observed between UB participants and comparable nonparticipants in high school graduation rates, UB participants did enter PSE at a significantly higher rate. Given PSE entry, subsequent continuation rates were about the same for both groups; therefore, a significantly larger percent of the UB participants remained in school after two years.
- Proportionately more UB participants than comparable nonparticipants applied for student financial aid for PSE. Although UB applicants received no more offers of financial aid, the offers they did receive were differently packaged--generally in the form of larger grants--and were perceived by recipients as more adequate.
- Substantial percentages of those individuals who had not entered PSE immediately following high school did enter some time later. Such delayed entry (or lag-entry) was proportionately greater for former UB participants than for comparable nonparticipants.
- Within each of the three grade cohorts (10th, 11th, and 12th grades), longer participation in the UB program was associated with greater PSE entry rates. While a single year of program participation was associated with only a negligible increase in PSE entry rate, two or more years of program participation were associated with significant increases in the likelihood of entry.

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[10] Burkheimer, G. J., French, A. M., Levinsohn, J. R., and Riccobono, J. A. Evaluation Study of the Upward Bound Program: A First Follow-up. Research Triangle Park, N.C.: Research Triangle Institute, September 1977.

[11] A more complete presentation of the study findings is provided in the executive summaries of the base-year and first follow-up studies, which are included as Appendixes A and B, respectively, of this report.

- There were differences in the types of students entering PSE from the UB participant and nonparticipant groups. Minority students, poverty level students, and students classified as academic risks were more likely to enter PSE from the former UB participant group than from the nonparticipant group.
- There were substantial differences in the types of PSE institutions entered by former UB participants and comparable nonparticipants. Former participants were more likely to attend four-year colleges or universities, institutions hosting a UB project, and institutions with relatively attractive financial aid policies.
- Greater proportions of former UB participants than comparable nonparticipants reported having experienced problems in educational progress due to poor high school preparation, family finances, and inadequate financial aid.
- Although UB projects differed markedly in types of operation and types of students served, no systematic indication of differential project effectiveness on the outcomes considered was indicated when differences in the characteristics of students served were controlled.

VII. THE CURRENT STUDY

A. Rationale

While the UB program objective (i.e., to generate in participants the skills and motivation necessary for success in education beyond high school) focuses on postsecondary success, the UB projects are not afforded any direct strategies for intervention once a participant leaves the project to enter college. In fact, certain follow-up intervention strategies within the entered PSE institution (e.g., continuation of adequate financial aid and provision of support services) may also be required to provide a sufficient set of conditions for success in PSE.[12] Thus, it might be argued that postsecondary outcomes per se should be considered beyond the scope of program influence and, as such, inappropriate criteria for program evaluation. Nonetheless, knowledge of the experiences of UB participants within the postsecondary educational milieu is of considerable interest.

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[12] The importance of such additional support is fully recognized in a companion program to UB, the Special Services to Disadvantaged Students (SSDS) program. There is no guarantee, however, that former UB participants will be accepted into such programs.

The base-year and first follow-up studies could not address many important questions related to such outcomes because of limitations in scope. The base year study considered only short-term PSE outcomes, reflecting, at most, progress through the first half of the first year of PSE. The first follow-up study addressed questions concerning postsecondary entry and persistence over a maximum of two and one-half years of potential postsecondary exposure.[13]

At the time of the second follow-up study, sufficient time had elapsed to measure long-term educational outcomes, including completion of a four-year college program, and to provide better estimates of intermediate outcomes.[14] Further, the second follow-up was designed to include information on more postsecondary outcomes (e.g., financial aid, availability of and demand for services). The additional data collected in the second follow-up study allowed the development of better measures of PSE outcomes that, together with previously collected information, permitted a more complete description of PSE progress, persistence and performance.[15]

Data were collected in fall and early winter 1978, approximately two years following first follow-up data collection, providing roughly equal intervals between the base-year, first follow-up, and second follow-up data points. All student grade cohorts could have completed at least two years of postsecondary education, under normal progression, and the most advanced cohort (twelfth grade) could have completed a four-year course of study.

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[13] For the most advanced cohort, the high school graduating class of 1974, the first follow-up data could reflect postsecondary progress only to the junior (or third) year of a four-year college program, given normal educational progression.

[14] For example, evidence from the first follow-up study suggests that there are differential rates of "lag" entry (i.e., entry into PSE after a significant delay following high school graduation) between the UB participant and nonparticipant groups. The previous studies, however, did not provide an adequate time frame or sufficient data to fully or effectively examine the relationship of UB participation to lag entry or reentry of prior PSE dropouts into the educational system. The second follow-up study allowed a much longer time frame and more appropriate data elements for deriving such estimates.

[15] For example, while the first follow-up study relied on unverified self-reports of highest grade completed as a measure of educational progress, the second follow-up employed a much more valid measure derived from extant student data contained in student transcripts. Transcript data also allowed examination of more quantitative measures of educational performance, such as grade point average and credits earned.

B. Objectives

The primary purpose of the second follow-up evaluation study of the UB program was to address questions concerning long-term progress, persistence, and performance in PSE by former UB participants and comparable nonparticipants. Further, while entry and persistence in PSE are important outcomes for UB, aspirations/expectations to continue education are also important program outcomes. For those students who do not attend PSE, perceived deterrents to educational attainment as well as current occupational status are also matters of interest. Finally, information related to receipt of financial aid and the demand for postsecondary support services were considered.

To meet these objectives, this study used extant data as well as additional data collected through a mail survey of previously sampled UB participants and nonparticipants and data from the obtained PSE transcripts of PSE-entering individuals (see Chapter 2). Also, the second follow-up study concentrated on the pattern of former UB participation, rather than relying on the simpler measure of extent of participation, since the first follow-up study had suggested that pattern of UB participation might provide additional explanation of student outcomes.

The major questions addressed in the second follow-up study center around the basic issues of educational persistence, PSE enrollment, progress, and performance, and on the relationships of these variables to pattern of participation in the UB program.[16] They are:

(1) What is the relationship of pattern of UB participation to educational progress and persistence?

(2) What is the relationship of pattern of UB participation to PSE performance?

(3) What is the relationship of pattern of UB participation to graduation from the PSE institution attended?

(4) What is the relationship of pattern of UB participation to educational aspirations?

(5) What is the relationship of pattern of UB participation to subsequent financial aid packages received (e.g., amount received and numbers and kinds of sources)?

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[16] Planning for the second follow-up survey instrument, survey methodology, and analysis was subject to review and input from staff members of the Office of Evaluation and Dissimination (OED), in which technical direction of the project was centered, from the Department of Health Education and Welfare (DHEW) internal review panel for the study, and from staff members of other interested federal agencies.

(6) What is the relationship of pattern of UB participation to PSE lag-entry rates?

(7) What is the relationship between pattern of UB participation and transfer from a two-year to four-year institution?

(8) What is the relationship between pattern of UB participation and the characteristics of PSE institutions attended?

Secondary analysis questions suggested by USOE and implicit in the second follow-up survey instrumentation are:

(9) What types of problems or difficulties have been encountered by former UB participants and nonparticipants in receiving the kind of education they desire, and to what extent have these problems been experienced? Are the types or nature of such problems a function of pattern of UB participation?

(10) What types of postsecondary services and programs have been available to former UB participants and nonparticipants? Is availability of services (i.e., numbers and kinds) a function of pattern of UB participation?

(11) What types of available services and programs have been utilized by former UB participants and nonparticipants, and to what extent have they been used? Is usage or rate of usage of available services a function of pattern of UB participation?

(12) What is the perceived adequacy of financial assistance available to former UB participants and nonparticipants who entered PSE? Is the perceived adequacy of financial assistance a function of pattern of UB participation?

(13) What is the relationship between pattern of UB participation and current work status for those individuals currently enrolled in PSE? What is this relationship for those not currently enrolled in PSE?

(14) What is the relationship of pattern of UB participation to current satisfaction with quality of life?

Chapter 2

Second Follow-up Study Methodology

I. OVERVIEW

This chapter provides a documentation of the data sources and sample sizes, data collection and processing schedules and procedures, analysis considerations and solutions, and the technical limitations or constraints that are necessary for a careful and proper interpretation of the findings. Although attempts have been made in this report to present the study description and findings in a non-technical manner (and to restrict the more thorough technical documentation of methodological procedures and constraints to the appendixes), some sections of this chapter are necessarily technical. Readers who desire only to satisfy themselves as to the general nature of these considerations and the care given to them, may wish to proceed directly to the findings in the subsequent chapters.

The second follow-up study was a continuation of a data collection effort on the sample of UB and comparison students selected for participation in the base-year survey (see Appendix C for base-year and follow-up sampling methodologies). Preparation for second follow-up data collection involved updating directory file information (i.e., names and addresses) for the 5,936 eligible sample members.[17] Update efforts included: (a) BHCE/USOE requests to originally selected UB projects to initiate local tracing activities; (b) an RTI newsletter mailing to study sample members, with request for corrected directory file information; (c) telephone tracing of individuals for whom newsletters were returned as undeliverable; and (d) further attempts at tracing through Departments of Motor Vehicles of the state of last known residence.

The second follow-up study represented a two-stage data collection effort. The first stage involved mailing a brief self-administered questionnaire[18] to eligible sample members. This mail survey was followed by a mailed thank you/reminder postcard, and by a second questionnaire mailing in about four weeks to nonrespondents. A probability sample of 1,500 mail survey nonrespondents was then selected for interview by telephone. The second stage of data collection involved obtaining academic transcripts from the PSE institutions currently or last attended by sample members, as indicated by the completed questionnaires or telephone interviews. An Institutional Request Package was mailed to all identified postsecondary institutions.

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[17] The base-year study involved a sample of 6,050 UB and comparison students; however, 114 of these original sample members had been classified as ineligible after completion of the first follow-up study due to their inappropriate definition in the initial sampling frame, death, or prior refusal. These ineligibles were not included in the second follow-up survey.

[18] The second follow-up questionnaire was designed to collect only information pertinent to the specific data needs of OED/USOE, with a minimum burden on the respondent in completing and returning the questionnaire.

Additional data were obtained from existing sources. Some student data (e.g., biographical information, prior education and work status, prior UB participation status) were available from a master file constructed during the base-year and first follow-up studies. Postsecondary school characteristics were obtained from an institutional data file provided by USOE.

The operational phase of the second follow-up study covered the period from April 1978 through September 1979. Major activities during this period involved data collection, processing, and analysis. To facilitate operations, the entire survey was monitored by a computerized control system from the time of first newsletter mailing until an edited machine-readable data base was established. All data collected in the study were maintained under strict control to insure confidentiality of individual data and to maintain data integrity.

Two different approaches to analysis were undertaken. The first approach was comparative/descriptive analysis and involved comparing outcomes of former UB participant groups with those of a group of nonparticipants which had been statistically adjusted for relevant background variables. Sample weights were used to account for unequal selection probabilities, and weight adjustments for data indeterminacy were implemented. This approach allowed computation of appropriate standard errors. The second approach was relational and more exploratory; using the individual as the analysis unit, modeling techniques were employed to explain selected educational outcomes on the basis of individual background factors, temporal/contextual factors, and pattern of UB participation. For the relational analyses, weights unrelated to sampling probabilities were used.

Throughout the study, care was taken to avoid techniques of data collection, processing, or analysis that would introduce bias into the study results. Concerted attempts were also made to collect and incorporate sufficient data to allow construction of meaningful analysis variables. Nonetheless, the study does not address all areas of potential educational success, and several limitations are imposed on the findings that reflect limitations of the data or of the procedures used in the second follow-up study. These procedures and limitations are described in the remainder of this chapter and in greater detail in the appendixes of this report.

II. SECOND FOLLOW-UP DATA SOURCES

The data used in the second follow-up study came from six separate data sets: (1) a Student Master file of data collected or constructed during the base-year and first follow-up studies; (2) the second follow-up survey control file; (3) responses to the second follow-up questionnaire; (4) a USOE institutional characteristics file of 11,010 PSE institutions;[19] (5) listings of funded UB and Special Services to Disadvantaged Students (SSDS) projects from 1974 through 1979;[20] and (6) data abstracted from student PSE transcripts. Each data source is discussed briefly below, and greater detail is provided in Appendix E.[21]

A. The Second Follow-up Questionnaire

The Second Follow-up Questionnaire was designed to collect data on the student outcomes specified in the study analysis questions (see Chapter 1, Section III).[22] RTI conducted clinical pretests of preliminary versions of the survey questionnaire, using students from nearby PSE institutions, to investigate clarity and ease of completion of the instrument. Based on reviews of the pretest results, the questionnaire was revised as necessary.

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[19] See C. D. Carroll, Characteristics of Postsecondary Education Institutions: Computer File Version 7907. USOE Technical Paper 79-12, Washington, D.C.: U.S. Office of Education, June 1979.

[20] See, for example, Johnson, D. D. and Sedorchuk, F. Directory of Funded Projects: Program Year 1978-79 (FY '78 Funds). Washington, D.C.: U.S. Office of Education, October 1978.

[21] See also Burkheimer, G. J., Richardson, J. E., and French, A. M. Data Base Design for the Second Follow-Up Evaluation of the Upward Bound Program. (Report No. RTI/1605/06-04S) Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, October 1979.

[22] This questionnaire was specified and designed by RTI in close collaboration with USOE/OED.

Two forms (A and B) of the Second Follow-Up Questionnaire were developed. The two questionnaire forms were identical in terms of format and content with one exception: Form B contained an additional question concerning extent and pattern of UB participation. Form A was to be mailed to each sample member for whom information regarding prior UB participation was available from previous surveys, and Form B was to be sent only to those for whom such information was missing.[23] Second Follow-Up Questionnaire items (on both forms) deal with current education and work status; educational history (types of schools attended and approximate dates of attendance); educational aspirations and expectations; sources, amounts, and perceived adequacy of financial support; and perceived deterrents to educational attainment. Copies of both forms of the Second Follow-Up Questionnaire are included in Appendix D.

B. The Institutional Request Package

Student PSE performance data (e.g., information pertaining to the individual's major field of study, grade point average, credit hours attempted/completed), as recorded on academic transcripts, were collected from the PSE institutions currently or last attended by sample members. An Institutional Request Package (IRP) was employed to solicit these transcripts. A copy of the IRP is included in Appendix D.

The IRP cover letter described the purpose of the study, stressed its importance, informed the administrator that RTI was conducting the survey for USOE, informed the institution of the rights of access to the information by referencing current Federal privacy legislation (enclosed separately), assured that such legislation would be scrupulously observed, and requested prompt cooperation of the school in this study. The letter further explained what was required of the school and informed the administrator that the standard transcript delivery fee would be paid to the school. Also included in the IRP were: (1) a computer-generated form containing a complete list of students who indicated attendance at that school and for whom transcripts were requested, with their approximate date of last enrollment; (2) a statement of procedures employed to insure protection of the individual's data; (3) pertinent sections of the current Federal Privacy Regulations; (4) an interpretation of the

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[23] By error, Form A was mailed to former participants only and Form B was sent to nonparticipants. When this error was discovered, the UB participation data for former participants who should have received Form B was collected by telephone.

Regulations, as applicable to this study, by the Office of the General Counsel, HEW; (5) a voucher for reimbursing the school for incurred expenses; (6) a "record of disclosure," for placement in the file of each involved student, stating that RTI/USOE had accessed the student's file; and (7) a postage-paid return envelope.

C. Other Data Sources

Additional data for the second follow-up were available from the base-year and first follow-up surveys.[24] This information was contained on a master file and consisted of encrypted student identification numbers; base-year and first follow-up sampling parameters (including raw sampling weight); individual response histories for the base-year and first follow-up studies; selected student characteristics and analytic variables determined during the base-year study; and analytic variables and analysis weights developed during the first follow-up study. Major variables extracted from the file were: (1) student classifying information (age, initial grade cohort, extent of prior UB participation, sex, race, academic risk status, poverty status), and (2) prior educational status in fall 1973, spring 1974, fall 1974, and spring 1977 (see Appendix E).

An Institutional Characteristics File was supplied by USOE.[25] Indices pertaining to the UB and SSDS host status of the institutions were not provided on this file; however, these indices were obtained from program directories and added to the data file.

III. DATA COLLECTION PROCEDURES AND RESULTS

This section describes the operations of collecting and processing data for the second follow-up study. Continued participation of the original sample members in this study was largely dependent upon RTI's success in locating, motivating, and establishing rapport with these individuals.

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[24] Research Triangle Institute, Upward Bound Follow-Up Evaluation Analysis File: Standard Codes and Tape Layout (Project 22U-889). Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, September 1977.

[25] C. D. Carroll, op. cit.. For institutions not contained on this file, data were logically imputed for those cases in which the school name was indicative of certain school characteristics.

Materials used by RTI to enhance cooperation and increase response included newsletters, $2.00 incentive checks, thank you/reminder postcards, and prompting letters. Additional methods involved BHCE/USOE-tracing of first follow-up nonrespondents and undeliverables, telephone tracing of sample members whose newsletters and/or questionnaires were returned as undeliverable, additional tracing through Departments of Motor Vehicles, and telephone interviews with a sample of mail nonrespondents. All of these operations were monitored by a computerized survey control system, as described in Section IV below. Greater detail is provided in Appendix E.

A. Preliminary Data Collection Activities

Although actual data collection for the second follow-up began in October 1978, preparation for this work began several months earlier. The first major activity involved updating the directory file for sample members. Activities relating to updating this file involved BHCE/USOE-tracing, newsletter mailings, and telephone tracing operations. As new names or addresses were obtained from tracing activities, returned mail, or other sources, the computer directory file was updated.

1. BHCE/USOE Tracing

The initial tracing effort was conducted by BHCE/USOE. RTI generated lists, by project, of last known names, addresses, and telephone numbers of nonrespondents to the first follow-up. BHCE/USOE forwarded these lists to the directors of the associated UB projects.[26] Project directors were requested by BHCE/USOE to obtain correct directory information for all listed individuals. Updates received from these projects were entered into the directory file.

2. Newsletters

As a second tracing effort, newsletters were developed and mailed to the last known address (forwarding address correction requested) of eligible former UB participants and nonparticipants in the original sample. The two newsletters, one for former UB participants and one for nonparticipants, presented selected results of previous surveys, announced that the second follow-up survey was underway, stressed the importance of continued participation, and requested that the individual return an enclosed postcard verifying or updating information on name, address, and telephone number. Copies of both newsletters with accompanying cover letter and return postcard are included in Appendix D. As a result of the newsletter mailings, 1,774 sample members returned the postcard either verifying or indicating changes in name and/or address. In addition, the postal service returned 679 newsletters as undeliverable.

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[26] Nonparticipants were associated uniquely with one and only one UB project by virtue of being associated with a high school served by the project.

3. Additional Tracing

Telephone tracing procedures were implemented if a newsletter was returned by the post office indicating that the mailing address for the individual was incorrect and that no forwarding address was available. Tracing information types and sources available from the previous surveys were: (a) last known address of respondent; (b) name, address, and telephone number of parents, guardians, or relatives; (c) name and location of the high school or postsecondary school the individual attended; (d) UB project (if applicable); and (e) neighbors or friends. Requests to Departments of Motor Vehicles, the final tracing activity, were initiated for 170 such individuals for whom birth date and/or social security number were available.

B. Mail Questionnaire Survey

Questionnaires were mailed to 5,874 of the 6,050 original sample members.[27] The initial packet of survey materials included a Second Follow-up Questionnaire with instructions, a cover letter from the Deputy Commissioner of the Bureau of Higher and Continuing Education, and the $2.00 incentive check. One week later, thank-you/reminder postcards were mailed to these same individuals as a prompting for questionnaire return.

Mail returns consisted of (a) packages returned by the postal service as undeliverable, (b) postal-service-supplied forwarding addresses, and (c) completed or partially completed questionnaires. As returns arrived, appropriate entries were made in the survey control system and subsequent operations were initiated. Name and/or address corrections were made in the directory file if warranted, and telephone tracing activities were initiated for undeliverable cases.

About four weeks after the initial mailing, a second questionnaire packet--containing the same materials as the first, except for the $2.00 incentive check, plus a prompting letter from the RTI project director--was mailed to

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[27] Excluded from the initial mailing were 114 individuals previously determined as ineligible for the second follow-up survey, 53 individuals for whom no current address was available, and 9 individuals determined by the newsletter/tracing operations to be deceased.

3,744 nonrespondents to the first mailing. Additional "remailings" were conducted for sample members whose first or second questionnaire packet had been returned as undeliverable but who had been subsequently traced. These remailings consisted of the same materials included in the first mailing, with a special explanatory letter from the RTI project director. Each of these mailings was followed one week later by a thank-you/reminder postcard to those individuals. Materials included in the several mailings are included in Appendix D. Follow-up and processing of returns to the second mailing and remailings were analogous to those for the first mailing.

A total of 3,005 questionnaires were received from the 5,874 eligible sample members involved in the mail survey, for a 51.2 percent mail return rate.

C. Telephone Interviews

The second follow-up study design incorporated a telephone follow-up survey of nonrespondents to the mail survey. It had been anticipated that mail respondents would differ from nonrespondents in terms of the educational outcome measures under consideration, and coverage of this segment of the original sample was considered quite important. Since cost considerations precluded contacting all mail nonrespondents, a stratified subsample of 1,500 mail nonrespondents was selected for telephone follow-up.

In determining a sampling frame, instrument response patterns were examined to detect possible response biases. Based on suspected biases, expected standard errors, analytic appropriateness, and expected costs, a sampling procedure was determined.[28] Ten strata were defined by the sampling frame, based on types of nonresponse (undeliverable or simply unreturned questionnaires), availability of first follow-up data (available or not available), and prior indication of PSE entry (previously indicated entry, previously indicated no entry, no previous indication). Sampling rates were established within each strata with disproportionately high rates being assigned primarily to prior PSE entry (in keeping with the major objectives of the study) and to simple nonrespondents (due to heavy cost factors estimated for contacting undeliverables).

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[28] The procedure developed was determined jointly by RTI and OED; it was optimal or near optimal for the parameters assumed. More detail is provided in Appendix C.

Individuals classified as "hard core" undeliverables (N = 255) were not included in the sampling frame.[29] Further, since response patterns showed no indication of serious response rate differences among other categories of interest (i.e., former participation status, initial grade cohort, UB project membership, race, sex, poverty status, or risk status), it was decided that different sampling rates within these categories were unnecessary.[30] Nonetheless, the sampling procedure ensured that all eligible sample members (excluding the "hard core" undeliverables) had a chance to be represented in the final data set. A more detailed statement of the sampling design is presented in Appendix C.

Telephone tracing and interviewing of those selected involved attempts to locate the previous nonrespondents and to collect, by telephone, the basic information on the Second Follow-up Questionnaire. During the tracing process, questionnaire information about the sample member was solicited from family members and other secondary sources. Any information so collected was used if the sample member could not be personally contacted; however, obtaining these secondary source data in no way restricted further attempts to contact the sample member. Of the 1,500 individuals selected for telephone interview, information was collected (from primary or secondary sources) on 1,259, for an 84 percent overall completion rate.

D. Institutional Requests Data Collection

Of the 4,264 respondents (mail and telephone) to the Second Follow-up Questionnaire, 3,090 indicated current or prior PSE attendance at 999 different institutions. Of these, academic transcripts were requested for only 2,656 individuals at 873 PSE institutions.[31] The survey plan had called for mailing of institutional request packages (IRPs) to all PSE institutions simultaneously. However, due to problems in identifying a number of the institutions involved at the scheduled mailing time, the transcript request survey was conducted in two waves.[32] The first-wave mailing of IRPs was sent to 634 postsecondary institutions; two weeks later, mailings were made to the 239 institutions in the second wave. Copies of materials included in the transcript request package (first and second waves) are included in Appendix D.

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[29] These individuals were considered as lost to the study at this point and their weights were appropriately redistributed.

[30] While these categories were not used to define formal strata, the sampling procedure used did take these factors into account to assure stochastic representation within the various categories.

[31] Transcripts were not requested for the remaining 434 sample members for the following reasons: (1) the respondent explicitly refused to grant permission to access his or her transcript data (N = 259), the PSE institution last attended was not identified (N = 68), or no current mailing address could be established for the PSE institution identified (N = 107).

Responses to the transcript requests were routinely processed, and appropriate notation was entered into the survey control system. Receipt of mail and telephone inquiries from schools were handled individually. Most of these inquiries were either to clarify transcript release policy or to seek additional identifying information (e.g., social security number) on students for whom transcripts had been requested.

Telephone follow-up activities were intiated for 194 institutions that had not responded to the first-wave IRP mailing, and 72 nonresponding institutions in the second-wave mailing. The purpose of these contacts was: (1) to determine if the institution had received the request, (2) if so, to urge early response, and (3) if not, to obtain the name of an individual to whom a second package could be mailed. IRPs were remailed to specified individuals in the latter schools.

Responses were received from over 93 percent of the institutions from which transcripts had been requested, and transcripts were received for about 87 percent of the sample members reporting attendance at those schools.

E. Overall Survey Return Rates

Of the 5,874 individuals in the second follow-up survey, information was obtained for 4,264, for a total (mail and telephone) response rate of about 73 percent. Sample coverage was higher (88 percent) due to the high contact rate among the mail nonrespondents subsampled for telephone interviews. Sample coverage was sufficiently complete to assure that any biases in the findings, due to peculiarities of the nonresponding group, would be relatively small.

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[32] More specifically, 331 PSE institutions (representing 433 students) were unidentifiable through any of the available directories at the scheduled mailout date. To avoid jeopardizing the overall project schedule, further efforts were made to identify as many of the unidentified schools as possible and to subsequently request transcripts. These efforts were successful in appropriately identifying and/or obtaining directory information for 239 of the previously unidentified schools (representing 326 students). Addresses could not be obtained for 92 PSE institutions and, therefore, it was not possible to initiate transcript requests for the 107 sample members who had reported current or last attendance at these schools.

Weight adjustment techniques (see Section VI of this chapter) were applied in an attempt to correct for any biases that may have been introduced by differential data availability.

IV. DATA PROCESSING AND MANAGEMENT

This section presents a brief description of the steps taken in data processing and management. Greater detail regarding these operations is provided in Appendixes E and F. Considerable effort was taken to produce a complete data set that was relatively free of the types of errors frequently introduced during processing.

A. Receipt Control

A computerized survey support system (described in detail in Appendix F) monitored the operational aspects of the second follow-up survey from newsletter mailout until all data had been collected and edited. Monitored events included mailout of materials (newsletters, questionnaires, transcript requests), nonrespondent sample selection, execution of telephone interviews, receipt control, and data editing. In general, this system maintained data that reflected the current survey status of each sample member, as well as useful historical information describing the sample member's sequencing through each defined survey event. To be effective, the system required timely input for each event that took place; therefore, as any of the events occurred for an individual, the event was entered into the system. Since this processing was performed on a flow basis, the events were reflected in the system within a few days of their occurrence.

In addition to providing a complete and accurate record of survey progress, the support system allowed rigorous quality control of data receipt and management activities through a series of internal checks. Such checks involved accessing an individual's current status prior to performing various data entry operations, which considerably reduced the likelihood of entering data for the wrong individual and virtually eliminated the problem of duplicate record entry.

B. Preliminary (Manual) Processing

Preliminary processing of returned questionnaires and transcripts was performed manually (see Appendix E). Second follow-up questionnaires returned by mail were checked-in by identification number, batched for document control,

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and forwarded to the manual coding/editing staff. Manual editing consisted of scanning the instrument for presence of a minimum set of key item data, followed by a more comprehensive edit of the completed questionnaire. Questionnaires that failed the key-item edit were separately batched and routed to the telephone follow-up staff, who attempted to contact the respondents to resolve any omissions or inconsistencies regarding these items. Additional editing was performed for most questionnaire items (e.g., to resolve inappropriate multiple responses). Manual coding involved assigning unique codes to the last attended PSE institutions reported. Edited questionnaire data were transcribed to machine-readable form by using direct data entry (key-to-tape) programmable terminals.[33] These terminals were programmed to accept a specific range of values and specific field widths for the data. Keystroke error rate was maintained at less than .5 percent.

The sequence of activities involved in processing student transcripts received from PSE institutions was similar to that described above for questionnaire returns; however, considerably more manual coding and editing were required. Briefly, the transcript coding operation involved abstracting and coding specific information from the large and diverse set of PSE transcripts. A standard Transcript Coding Form (see Appendix F) was developed for this purpose.[34] In addition to overall PSE performance data and academic attendance history, courses appearing on the individual's transcript had to be coded into several content areas, and performance indices were computed within each area. Thus, in contrast to the questionnaire coding, the transcript coding was not a clerical operation, but one that demanded frequent judgments by the coder. Data on the Transcript Coding Form were subsequently keyed through the key-to-tape equipment described above.

C. Machine Processing

All subsequent processing of questionnaire and/or transcript data was computerized (see Appendix E). Such processing was undertaken for two purposes:

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[33] Major advantages of this procedure were higher speed, fewer processing steps, and lower transcript error rate.

[34] See also Riccobono, J. A., Wisenbaker, J. M., and Burkheimer, G. J. Description of Procedures Employed in Developing and Implementing a Transcript Processing Manual for the Second Follow-Up Evaluation of the Upward Bound Program. (Report RTI/1605/06 - 03 S). Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, October 1979.

(1) to produce an accurate transcription of edited second follow-up questionnaires, and (2) to create analysis variables from these data and data from other external sources.

Once questionnaire or transcript information had been keyed, data were edited and merged into a student data file, which had been created from the first follow-up student master file. Editing consisted of: (1) checks of student and institutional ID number for accuracy, (2) checks to ensure that all data elements were within prescribed valid code ranges, (3) checks to ensure that data elements within a given source (i.e., questionnaire or transcript) were internally consistent, and (4) checks to ensure consistency of data from one source with data from other sources (e.g, consistency of second follow-up questionnaire responses with transcript data and with previously collected data.[35] Entry of edited data was performed through the survey control system, and attempted entry of improper data was rejected. Once questionnaire data were entered into the file, the file was augmented by sample members' PSE transcript data and additional data pertaining to the characteristics of PSE institutions last attended by sample members.[36] This was done by matching the unique code of the institution indicated by the sample member to an institutional file containing previously constructed indices (see Appendix E).

The final step in data processing involved the creation of analysis variables. These variables, detailed in Appendix E, included: (1) various measures of educational progress/persistence and performance from the questionnaire response and transcript data, (2) measures of other student outcomes from questionnaire responses, and (3) classifier variables for comparative/ descriptive analyses and predictor variables for relational analyses, primarily from base-year data (see Appendix E).[37]

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[35] Instruments with improper identification codes were rejected during editing for subsequent resolution; out-of-range data were recoded to an indeterminate value code; and inconsistent data were entered into the data file with an accompanying inconsistency flag.

[36] This was applicable, of course, only for those who had attended a PSE institution. For those who had not entered PSE, a legitimate nonresponse code was used.

[37] The major exception was pattern of UB participation, an index that was derived exclusively from questionnaire responses.

V. DATA QUALITY

In addition to nonresponse and undercoverage, two data quality problems that are typically present in questionnaire surveys are: (a) partial data sets, introduced by incomplete, inconsistent, or otherwise indeterminate responses on returned questionnaires, and (b) questionable validity of responses. This section addresses these issues; greater detail is provided in Appendix E.

A. Data Availability

A complete set of data elements was not available for all respondents to the questionnaire. Lack of data could have resulted from indeterminacy within any of the four basic data files used (the Student Master File, the Second Follow-Up Questionnaire, the Institutional Characteristics File, or the Student Transcript File). General availability of Student Master File data has been documented in the base-year[38] and first follow-up[39] final reports.

Among the 4,264 sample members from whom a Second Follow-Up Questionnaire response was obtained, the relevant base-year variables were available for more than 98 percent of the cases with the exception of poverty status and age within grade.[40] Poverty status was available for 91 percent of the second follow-up respondents, and age within grade was also available for more than 90 percent.

Data indeterminacy rates for second follow-up questionnaire items were relatively small. Overall data element indeterminacy rates averaged (median) about 8 percent; however, this figure was reduced about two percentage points through logical imputation procedures. For items not predicated on postsecondary attendance, item indeterminacy ranged from a low of about 1 percent (for question 1) to a high of over 25 percent (for question 12.2). Among items specifically related to postsecondary attendance, item indeterminacy ranged from 1 percent (for question 8) to 18 percent (for question 5.16). Most data indeterminacy was due to item nonresponse; for the items subject to consistency checks, all showed less than a 5 percent inconsistency rate.

Of the 2,310 transcripts obtained, key information such as overall GPA

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[38] Burkheimer, et al., 1976. (op. cit.).

[39] Burkheimer, et al., 1977. (op. cit.).

[40] This pattern of differential availability of poverty status classification was also noted and reported in the base-year and the first follow-up studies.

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was available in over 88 percent of the cases. The PSE institutional data file, as augmented by project directories and minimal imputation, yielded institutional data for all of the 3,022 second follow-up respondents who reported the name of their last attended institutions. Complete information was available for all variables obtained from the file except institutional cost, which was missing for less than three percent of the cases.

B. Data Validity

Validity of data is a concern of all studies that rely on unverified student responses. Invalid responses may be due to many possible sources: response bias, deliberate attempts to mislead, lack of understanding or misinterpretation of questions, and simple errors in marking responses. No direct validation of collected data was attempted in this study due to cost considerations; however, three indirect efforts were attempted involving examinations of data reliability.[41] One examination was based on a comparison of responses from duplicate returns;[42] another involved checks on the consistency of follow-up data with base-year data, and a final check was for intercoder reliability in coding transcript data. These investigations of reliability are detailed in Appendix E.

Examination of duplicate returns indicated a high degree of agreement with respect to the most objective items (e.g., completion of high school, exposure to PSE, earning a Bachelor's degree) but considerably less agreement on more subjective items (aspirations, expectations, problems experienced). Some items related to financial aid exhibited very poor reliability (e.g., amount of aid received). Consistency of follow-up data with base-year data indicated no serious inconsistencies (i.e., inconsistency rates of less than 3 percent).

The only systematic investigation of data reliability involved the coding process employed with the student transcript data. A random sample of transcripts was assigned to all coders, and intercoder reliabilities were assessed. The simpler, more directly obtainable variables showed the highest reliabilities (e.g., credit type, indicator of academic problem, indicator of transfer credits). Total earned credits and overall GPA were also very reliably coded. Efforts to determine total credits and GPAs within curriculum content areas proved to be less successful due to ambiguities in the diverse course classification schemes reported on the transcripts.

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[41] Reliability is, of course, a necessary, but not a sufficient, condition for validity.

[42] Due to overlapping of the data collection steps, some individuals returned two completed mail questionnaires and some who were interviewed by telephone also returned a mail questionnaire. The subset of individuals with duplicate returns does not, of course, represent a random or representative sample of cases.

The real danger of the validity problem is that of differential validity of responses between the UB and comparison groups. While a lack of reliability and validity serves to introduce error into the data, if this error is the same (regardless of direction or magnitude) within the UB and comparison groups, then group differences will show no directional bias. If, on the other hand, the data from one group are biased in a particular direction and those from the other group are unbiased (or biased in the opposite direction), then the bias will remain (or be magnified) in the group differences. None of the reliability or consistency checks were sufficient to address this issue, and, while there is no reason to suspect differential response biases, a possibility of this source of error in group differences does exist.

VI. ANALYTIC CONSIDERATIONS

Detailed analysis plans were jointly specified by RTI and USOE prior to completion of second follow-up data collection activities.[43] In addition to routine investigations of data quality, two basic approaches to analysis were implemented, a comparative/descriptive hypothesis-testing approach and a more exploratory relational approach. These approaches have different strengths and weaknesses, but one tends to compliment the other. Taken together, they provide a rather comprehensive examination of the analysis questions established for the study (see Chapter 1). Both of these analytic procedures differ from those used in previous studies, so that direct comparison of second follow-up results to previous results is not strictly appropriate.

It is important to realize that, while both sets of analyses may show relationships, they do not establish causation. The existence of a relationship between two variables is a necessary condition for the existence of causation, but it is not a sufficient one. In addition to a relationship between two variables, establishment of causation requires that: (a) the causal (antecedent) variable logically precedes the effect (consequent variable); and (b) no other antecedent variable exists which may explain both the antecedent and consequent variables under consideration. While the first of these requirements is often fairly easy to establish, the second is extremely difficult to establish outside the true experimental paradigm.[44]

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[43] Burkheimer, G. J., Fuentes, E. F., Riccobono, J. A., and Wisenbaker, J. M. Data Analysis Plan for the Second Follow-Up Study of the Upward Bound Program. (Report RTI/1605/05/ - 01 S). Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, March 1979.

In examining the UB program, it would be extremely difficult, if at all possible, to identify and measure all the relevant variables which may influence one another, selection of students into the UB program, and/or student outcomes. Moreover, the nature of the study methodology is such that it is not possible in all cases to determine even the temporal order of occurrence of two events. Thus, even when strong associations exist between previous UB participation pattern and current student outcomes, the possibility still remains that these associations could be largely a function of other unconsidered (or unmeasured) antecedent variables.

A. General

Although concerted attempts were made in conducting analysis to avoid the potential for bias and to avoid potentially misleading comparisons, not all attempts were equally successful. The constraints and limitations of analyses should be considered when results are interpreted. Both of the analysis techniques used are relatively complex approaches to general linear modeling and both are subject to specific limitations. There are, however, certain general limitations applicable to both approaches and to the data analyzed; these limitations are discussed in this subsection.

Both analysis techniques assume specific distributional properties of the variables analyzed, but these assumptions were met only to varying degrees. Moreover, scale properties of some of the variables analyzed were not sufficiently strong to meet the assumptions of the analytic models. While none of the specific violations of model assumptions were considered to be critical (in fact, most represent generally accepted practices), the several violations, in combination, could lead to spurious results. There are also several potential sources for error in the statistics computed. Measurement error is an obvious source of such error and has been addressed in the previous section. Other sources of error are sampling error and bias.

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[44] Although advances have been made recently in the area of causal modeling for nonexperimental or quasiexperimental research paradigms, the assumption of inclusion of all relevant variables in the model is a basic tenet in these approaches.

Sampling error is reflected in almost any estimate of a population characteristic from data collected from a sample of that population. This error is introduced by the fact that the computed estimate will vary from one specific sample to another. This error is typically incorporated in statistical tests of reported differences, through one or another assumptions about the characteristics of the error under the sampling procedure used. Sampling error should be considered, however, in interpreting specific estimate values reported in subsequent chapters. The estimates reported may vary from the true population value as a result of sampling error.

The potential for bias in the results also exists. Bias is typically introduced through a *systematic misrepresentation* of the population in the sample. While the full sample drawn in the base-year study would have led to unbiased estimates, this is not necessarily the case for subsets of the full sample. When data collected include nonresponse and/or less than complete coverage of the sample, then the potential for bias exists when making population estimates from the subset of individuals who have provided data. It is quite likely that nonresponse or other factors leading to data unavailability (e.g., sample attrition since the base-year study) is not random and that bias has been introduced in some point estimates. There is little indication, however, that any nonrandom sample loss was systematically different for former participants and nonparticipants, thus *differences* between these two groups may show less bias than the estimates within each group, from which the difference is formed.[45]

Attempts were made in analysis to reduce the potential for bias in results, through adjustment procedures. Since the adjustment procedures differed substantially for the two analytic approaches, they are discussed separately below for each approach (Subsections VI.B and VI.C). The extent to which these adjustment procedures were effective is primarily a function of the extent to which the assumptions underlying the procedures were valid.

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[45] If the bias is constant for both groups, then it effectively cancels itself when a difference is formed.

B. Limitations Concerning the UB Participation Pattern Variables

Most analyses considered pattern of participation in the UB program; this variable suffers some confounding in relationship to other variables. Two separate classifications of UB participation pattern were examined; one yielding two groups of former participants (typical and atypical) plus a group of nonparticipants, the other yielding four groups of former participants in addition to the nonparticipant group. Eight unique participation patterns (including nonparticipation as a pattern) were possible in all, and both of the considered classifications necessarily involved collapsing of unique participation pattern groups; as a result, some heterogeneity of unique patterns exists within the two partitionings considered for analysis.

More importantly, some participation patterns are confounded with grade cohort (e.g., grade level in fall of 1973). For example, an individual selected as a participant in the 10th grade can exhibit only four unique patterns: (1) 10th grade only, (2) 10th and 11th grade, (3) 10th and 12th grade, (4) 10th, 11th, and 12th grade. Similar confounds exist for other cohorts.[46] Because of the constrained nature of participation pattern as a function of original cohort, analyses that did not also consider cohort may be slightly misleading.[47]

One disturbing problem with the participation pattern by grade confound was a relatively large group (N = 233) of former participants who were initially selected into the twelfth-grade cohort but who reported no twelfth-grade participation in the UB program.[48] Given the sample selection process (see Appendix C), these individuals may represent those who were in the program during the summer prior to their senior year (and were still on the roster when the sample was drawn), but who did not continue their participation during their senior year.

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[46] Even though the approach taken in this study allowed for nonparticipant crossovers, which relaxes some of the constraints on possible participation pattern within a given cohort, the number of crossovers was so small that any unique pattern defined exclusively by crossovers typically had to be collapsed into another pattern classification.

[47] Even though some statistical control for cohort was exercised in such analyses, the meaning of UB participation category varies as a function of cohort, suggesting an interaction, and marginal adjustment for cohort does not account for that particular confound.

[48] Only a small percentage of this group could be attributed to individuals with prior UB participation who were inappropriately selected into the nonparticipant sample.

An additional problem is related to the temporal relationship between participation pattern and educational progress/persistence. While different patterns of participation in the program may be seen as theoretically preceding further educational progress, this is not necessarily the case. In particuar, dropping out of high school (cessation of educational progress) leads to termination (and thus limitation) of program participation. This problem could produce over-estimates of relationships of participation pattern to educational outcomes. For this reason, examination of educational outcomes beyond high school graduation (e.g., entry into postsecondary education) was restricted to high school graduates. While this reduced the severity of the problem, it did not completely eliminate it.[49]

Another problem is the so-called "survivor effect," which is a form of group self-selection. This phenomenon has a strong potential for existence in the participation pattern variables used. As an example, consider the comparison of the educational progress of two groups of twelfth graders; one group consisting of individuals who joined UB for the first time during their senior year, the other consisting of those who participated in UB in the tenth, eleventh, and twelfth grades. Even if the groups are equated on certain background factors, they are different in important ways, since one group consists of students who "survived" on their own in a school system through which the other group had been specifically assisted by the program (i.e., to become seniors).

While the statistical approach and methodology employed represented an attempt to reduce, to the extent possible, problems inherent in the use of UB participation pattern as the major explanatory variable for the study, complete control was not realized, as indicated in the preceding discussion. Therefore, the associated limitations in the analytic results should be acknowledged and anticipated.

C. Comparative/Descriptive Analysis

1. Rationale and Procedure

The comparative/descriptive approach is descriptive in the sense that estimates were produced, for both UB participants and nonparticipants, of group characteristics (e.g., pertinent experiences, characteristics of PSE institutions attended), and comparative in that group or subgroup differences on outcome or criterion variables were estimated as a function of the pattern of UB participation.[50] While similar in nature to the comparative/descriptive analyses performed in the base-year and first follow-up studies, with the student as the unit of analysis, these analyses differed considerably from previous ones in terms of the specific techniques used.

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[49] For example, a high school "stop out" could ultimately complete high school at a later time; the "stop out" that contributed to the atypical UB participation pattern would also introduce a time lag that would be reflected in subsequent educational progress.

In prior comparative/descriptive analyses, statistical control for differences between participants and nonparticipants was obtained through a form of balancing.[51] The degree of additional statistical control required by the current study (e.g., control within each of the patterns of UB participation, and control within types of PSE institutions), could not be accommodated, by the previously-used technique. Thus, a more common approach to statistical adjustment (covariance adjustment for main effects through a general linear model approach) was employed (see Appendix H).[52]

In general, these analyses were restricted to the examination of single degree-of-freedom comparisons of relevant means or proportions for a given outcome. Omnibus tests for main effects or interactions were neither planned nor implemented; rather, differences in proportions or means between relevant subpopulations were considered. For each difference (single degree of freedom contrast) appropriate standard errors were calculated, allowing for sampling effects, through use of Horvitz-Thompson estimators and Taylorized deviations.[53]

Some analyses were performed within initial grade cohort, since certain educational outcomes (e.g., educational progress) were restricted in the value they could assume by the sample members' educational starting point during the base-year study. Other analyses were performed for the total participation pattern groups, combined over grade cohorts, with appropriate adjustments. Additional partitioning of groups on other factors was undertaken to the extent possible, particularly in examining PSE outcomes when such factors (e.g., institutional level of offering) were considered to be logically related to the outcome under consideration. For most major analyses, the specific *a priori* contrasts constructed within a given partition of the groups were those reflecting major USOE interest (i.e., the contrasts between the typical and atypical participant groups and between the typical participant group and the nonparticipant group).

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[50] In such comparisons, nonparticipants may be classified as individuals with a pattern of no participation in UB.

[51] After the comparison group had been adjusted to reflect the same distribution of sex, race, poverty status, academic risk status and grade cohort as the UB participant group, comparisons were made between the groups using software developed specifically for the UB evaluation study, which compensated for the adjustment technique. See Appendix E of Burkheimer, et al., 1977, (op. cit.).

[52] Although more factors were adjusted by this technique, it should be recognized that none of the interactions of those factors were considered as was accomplished by the previous technique.

[53] Holt, M. M., SURREGR: Standard Errors of Regression Coefficients from Sample Survey Data, Research Triangle Park, N.C.: Research Triangle Institute, May 1977.

The group of individuals who were originally identified as nonparticipants but who subsequently reported participation in UB (subsequently called "crossovers") were considered for the first time in these analyses. Because of the large differences in analysis weights between former participants and nonparticipants (reflecting markedly different selection probabilities) and the fact that these individuals could no longer legitimately remain in the nonparticipant group, they were excluded from first follow-up analyses. In the current study, a methodology for incorporating these individuals into the participant group was implemented (see Appendix G).

2. Limitations

The approach used for these analyses relies heavily on the efficacy of the statistical adjustments, and is thus bound to the assumptions of those techniques. Although statistical adjustments were effected for the set of available measures, there is no guarantee of control over other basic differences between the participant and nonparticipant group. The use of single-degree-of-freedon contrasts, as opposed to omnibus tests, also has disadvantages in that *a priori* contrasts may not fully exploit the nature of the available data, and may thus obscure other results of interest, particularly interactions.

Complex statistical adjustments were performed in conducting the comparative/descriptive anslyses (see Appendixes G and H). In general, the computed standard errors compensated for the assumptions of the adjustment techniques; however, the extent to which adjustments could be made were limited. Two basic types of adjustment were performed: (1) weight adjustments for nonresponse and item indeterminacy, and (2) statistical adjustments for the effects of variables related to both UB participation pattern and to an outcome under consideration.

Weight adjustments, in general, consisted of apportioning the sampling weights of individuals with indeterminate data to responding individuals "most like" the nonrespondent.[54] Weight adjustment cannot be expected to eliminate all nonresponse bias, however, except under the most trivial circumstances. The group of nonrespondents considered most problematic for this study are those who could not be located (representing sample attrition). Intuitively, less educational progress might be expected from this group than from those with whom contact was maintained.

Further, the weight smoothing technique used to compensate for the nonparticipant crossover greatly increased the total weights of the former participant group (although weights for any individual originally selected as a participant relative to the total group remained stable). For this reason, estimates of total counts within the former participant groups are not reported. Also estimates of educational progress may be artificially high.

Statistical control was also implemented for differences among former participants and nonparticipants on background and contextual factors thought to be related to educational attainment or success. Significant differences among the groups in these areas were documented in the base-year and first follow-up studies and are shown in Table H.1 (Appendix H). The statistical adjustment techniques used in the second follow-up--consisting of covariance adjustment and partitioning of sample groups--introduced some problems. For one, the available analytic methodology in combination with the original sampling procedures placed stringent limits on the number of variables for which covariance adjustments could be made. Additionally, base rates for some variables severely limited the extent to which partitioning could be employed, while maintaining adequate cell sizes.[55]

Two basic compromises were made in performing the statistical adjustments. First, covariance adjustments were restricted to marginal distributional properties; joint distributional properties (which were considered in prior studies and which allow for variable interaction) were not considered. Second, partitioning was much more restricted than would have been desired. Thus, while statistical adjustment was introduced for more variables than had previously been possible, control was not realized for the full set of potential moderating variables, and, for some factors, control was not realized to the same extent as had been achieved in previous studies. Consequently, the potential for attributing effects of some uncontrolled or only partially controlled variable to UB participation pattern is high. Although this limitation is characteristic of nonexperimental research, it should be kept in mind when considering the results.

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[54] This technique assumes that most of the nonresponse bias is captured within the categories defining "most like" (i.e., the weighting class). This assumption is more reasonable for some types of nonresponse than others; however, nonrespondents differ even from similar respondents by virtue of their nonresponse.

[55] Even greater constraints on cell sizes than would normally be imposed were introduced for appropriate calculations of standard errors, which relied on within strata estimates.

D. Relational Analyses

1. Rationale and Procedure

Although the comparative/descriptive analyses addressed all stated analyses questions, they permitted some loss of information by adjusting out the influence of background and contextual variables. A comprehensive approach to analysis would consider student outcomes as related to the student characteristics (e.g., age, sex, ethnicity, poverty status, academic risk status, and grade level) and/or contextual influences (e.g., financial aid, institutional level of offering, institutional selectivity, size of student body), as well as to pattern of UB participation. The relational analyses are designed to serve this purpose.

In general, this approach implies questions related to the PSE environments within which UB participants and nonparticipants are placed. Such questions may be addressed through the formulation of educational models and the subsequent examination of data collected in relation to those models. This modeling is embodied in recently developed techniques collectively known as structural equation modeling. Such analyses were conducted for a selected subset of outcome variables to which these techniques were reasonably applicable.

These analyses start with a model of how various data elements relate to each other over time, i.e., a model of directional relationships. Within the adopted model, such relationships are specified for all elements, and the overall relationship ("effect") between two variables is decomposed into (a) a part that operates through intermediate variables, indirect effects and (b) a residual part that cannot be attributable to intermediate factors, the direct effect. Thus, some portion of total relationship is due to relationships

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through other variables and the remaining portion represents the direct relationship that is not otherwise explained.

This technique is particularly suited to the longitudinal data of this study, but is less well suited to the underlying sampling methodology. For that reason, specific analysis weights were developed for this examination that ignored sampling considerations. While this limited the generalizability of the results, it did reduce other technical problems which otherwise could have led to misleading solutions. For a detailed discussion of this analytic technique, see Appendix I.

2. Limitations

The limitations associated with these analyses can be classified into two areas: (a) limitations of the technique per se and (b) limitations specific to the use of the technique within the current study. Limitations of the first type are inherent in assumptions that underlie the procedure, while limitations of the second type concern additional assumptions made in current use of the procedure.

The procedure assumes a model that has been developed and, thus, is subject to errors in specification of that model. While tests are available to determine if the model provides a reasonable fit to the data, no tests are available to determine if the adopted model provides a "best fit." Moreover, all estimates produced from the analysis are completely conditional on the model that has been assumed (different models could produce different estimates). Additionally, the procedure used is not amenable to consideration of interactions, and is most interpretable under the assumption of a strictly additive model. In this regard, the comparative/descriptive approach is equally limited.

While the procedure used can accommodate unequally weighted data elements, it is not particularly suited to stratified cluster samples such as the one available in this study. In particular, the standard error estimates provided by the procedure do not incorporate design effects reflecting stratification or clustering. For these reasons, the analyses were treated as exploratory and additional assumptions were made in calculating analysis weights. The weights produced were unrelated to sampling probabilities, thus restricting generalizability of results (see Appendix G). An additional assumption of randomness of nonresponse was made to facilitate analytic operations. While such an assumption is convenient, it cannot be supported on theoretical or empirical grounds.

Chapter 3

Outcomes as a Function of Upward Bound Participation Pattern

I. OVERVIEW

The analysis questions in Chapter 1 concern relationships between previous pattern of participation in the UB program and various educational outcomes. The present chapter addresses those questions. This chapter is organized according to the basic issues addressed by the second follow-up study, rather than strictly in terms of the sequentially listed analysis questions. Section II presents results that are related to general educational outcomes (i.e., analysis questions 1, 4, 6, 9, 13, and 14). The characteristics of the PSE institutions attended by participants and nonparticipants and their experiences with financial aid and various support services offered (analysis questions 5, 7, 8, 10, 11, and 12) are described in Section III. Section IV provides an examination of postsecondary progress, persistence, and performance (analysis questions 1, 2, and 3).

A. General

A comparative/descriptive, hypothesis-testing approach was used to produce the findings reported in this chapter. All results in this chapter are based on weighted data and represent national estimates of differences among former UB participants and nonparticipants, after adjusting or otherwise controlling for background and contextual factors. Detailed technical information regarding these analyses is included in supporting appendixes.[56] In general, the analyses consisted of comparisons among UB participants showing a typical pattern[57] of former participation (hereafter termed "typical participants"), former participants with other patterns of participation ("atypical participants"), and nonparticipants. References to base-year and first follow-up findings are also provided, where applicable, although comparison of current findings to results from previous studies is appropriate only in a general sense.[58]

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[56] Appendix E provides the specifications for developing the analysis variables used; Appendix G provides a description of the various weight adjustment techniques; and Appendix H details the approach, rationale and limitations of the comparative/descriptive analyses.

[57] Typical UB participation pattern is defined as participation in grades 10, 11, and 12, or in grades 11 and 12. Atypical UB participation is defined as any other pattern of former participation (e.g., in grades 10 and 11 only). The comparisons made were single degree-of-freedom contrasts; a form of covariance adjustment for main effects was employed through a general linear model approach to control for preexisting differences between these groups in respect to other variables thought to be related to the outcomes.

Although the analyses underlying the findings reported in this chapter were relatively complex, these complexities are not detailed in the text. Rather, the results are presented with reference only to their statistical significance (determined throughout this chapter at the .05 level of chance). The mode of data presentation used in this chapter is graphic rather than tabular. More detailed summaries of each analysis conducted are provided in appropriately referenced tables of Appendix H.

B. Conceptual Framework Underlying Considerations of Major PSE Outcome Variables

Some analysis variables used in this study represent rather sophisticated underlying concepts or constructs. This subsection provides the conceptual framework underlying construction of the major educational outcome measures--performance, progress, and persistence--that were used to address many of the study analysis questions. Distinguishing between these three concepts is difficult, because they are highly interrelated.

Educational performance may be defined and measured in a variety of ways. Grade Point Average (GPA) may be used to measure this outcome since this index is traditionally used by schools. Educational performance is, however, much broader than the simple average of a student's grades taken over academic credits earned. Quality of performance is situation-specific; what may be considered good performance in one situation (e.g., a "B-" average in a highly competitive or selective four-year institution while working part-time) may not necessarily be considered as good under different circumstances (e.g., a "B-" average in a junior college while not working). Even within a particular school setting, quality of performance might be judged differently for different curricula or programs of study, in which case comparing GPAs from different program areas would be inappropriate. Regardless of the measure used, however, there are relationships of performance to progress and persistence; in particular, sufficiently poor performance on the part of an individual can lead to termination of his educational progress and persistence.

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[58] While the focus of second follow-up analysis is similar to that of previous studies, it is not safe to assume that findings are directly comparable in the strictest sense, since the analytic methodologies employed in the current study differed considerably from those employed previously.

The two other major constructs, educational progress and educational persistence, are even more difficult to distinguish. Both educational progress and persistence are defined only in relation to some goal. Progress implies movement toward that goal, whereas persistence implies continued effort toward achieving the goal (which can occur without movement toward the goal). Thus, the two constructs are closely related (persistence being a necessary but insufficient condition for progress) and both are time dependent (e.g., an upper limit is placed on progress by the length of time in school). Moreover, the constructs are typically multifaceted, and measurement can occur at several levels.

It is possible to assess educational progress independently of the underlying goal (although some goal is implied). Progress may be measured by determining whether or not certain educational milestones (high school graduation, PSE entry, PSE graduation, graduate school entry, etc.) have been attained or by determining the extent of movement toward such milestones. Since persistence is necessary for progress, measures of educational progress also measure some aspects of persistence.

Persistence is more difficult to measure, since it has more facets than progress and is more goal-related. Since measures of educational progress also measure certain aspects of educational persistence, it is as accurate to say that one has progressed through the third year of college as it is to say that one has persisted through the third year of college. On the other hand, persistence can occur without progress toward the goal,[59] but the goal is still an important aspect of persistence.[60]

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[59] It is also possible to persist (educationally) without actually being enrolled in school, as in the case of an individual who works full time for a year in order to obtain sufficient funds to continue his education.

[60] An individual who has attained his goal of a two-year technical training program may be considered to have persisted to his goal, while an individual whose goal was a graduate degree but who has temporarily or permanently ceased his education after a four-year diploma has progressed farther but has not persisted to his goal.

In addition to the complex relationship between the constructs, measures of progress and persistence are time-bound.[61] They may reflect not simply progression and persistence in the educational system but also the timing or pace of that progression. For educational paces other than normal, measures of individual performance, progress, or persistence at a particular time may be misleading.[62]

II. GENERAL EDUCATIONAL OUTCOMES

As indicated by the base-year study, UB projects differ substantially from site to site in terms of emphases and services offered. Nonetheless, the general aims shared by the projects are to generate in each participating student the motivation for postsecondary study, to assist the student in completing high school and in gaining admission to a PSE institution, and to provide the student with the skills needed for completion of PSE. Such skills are not restricted to academic skills and competencies, but also include the ability to recognize and cope with common problems of education. The basic tenet underlying the program is that additional education will help the participant to achieve a more successful and satisfying life than would otherwise have been realizable.

This section addresses some of the outcomes associated with the aims of the UB program as outlined above. The findings reported in this section result from analyses that generally were applicable to all sample members.

A. Educational Aspirations and Expectations

The UB program is designed to generate in participants high educational goals and to provide the skills and support necessary for these individuals to have reasonable expectations of obtaining those goals. The study therefore examined educational aspirations and expectations.[63] The reported aspirations of typical participants, atypical participants, and nonparticipants are shown in Figure 1 (see also Tables H.2 and H.3). The aspiration patterns of atypical former participants and nonparticipants are quite similar,[64] but the pattern for typical participants shows significantly higher aspirations. Closer examination of these patterns indicates that the major differences occur in: (1) the lower rates at which typical participants aspire to only a high school education or to education within a vocational/technical school, and (2) the higher rates of aspiring to graduate study within the typical participant group.

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[61] Performance measures are less time bound, depending on the measure used, but even PSE GPA is known to vary as a function of student class (e.g., freshman, sophomore, etc.)

[62] For example, this study was conducted five years after the sample members were beginning their tenth, eleventh, or twelfth grade in high school. Under an ordinary educational pace, this would be ample time for all sample members to have completed high school and entered some form of PSE; for those who were high school seniors, sufficient time had elapsed to have completed a four-year college program. For paces other than normal, these are not necessarily valid expectations.

Expected educational attainment may be a more realistic measure for appraising potential for future accomplishment. The reported educational expectations for the three participation pattern groups are provided in Figure 2 (see also Tables H.4 and H.5). While expectations are generally lower than aspirations (as anticipated), differences in the patterns of expectation among the three groups are quite similar to aspiration differences. While almost three-fourths of the typical former participants expect to complete at least a four-year college program, less than three-fifths of the atypical participants and slightly more than half of the nonparticipants have such expectations. The similarity between the expectations of atypical participants and nonparticipants is still evident, though less marked than was the case with aspirations. Major expectation differences between typical participants and the remaining two groups are again in lower rates for high school or vocational/technical school and higher rates for graduate training.

These results are consistent with those of the base-year and first follow-up studies. There are, however, interesting trends across the three studies in overall aspirations and expectations.[65] While nonparticipants show an increase in aspirations from the base-year to the second follow-up, aspirations

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[63] Although the concepts of aspiration and expectation are theoretically and empirically interrelated, the survey instrument attempted to measure the two constructs separately (see Appendix D).

[64] Although the difference between atypical participants and nonparticipants was not one of the a priori contrasts of interest (and, thus, was not tested statistically), the minor differences indicated in Figure 2 are considered too small to be of interest.

[65] The comparison over years is not completely straightforward due to minor changes in wording of the item measuring these constructs and to differences in analysis methodology.

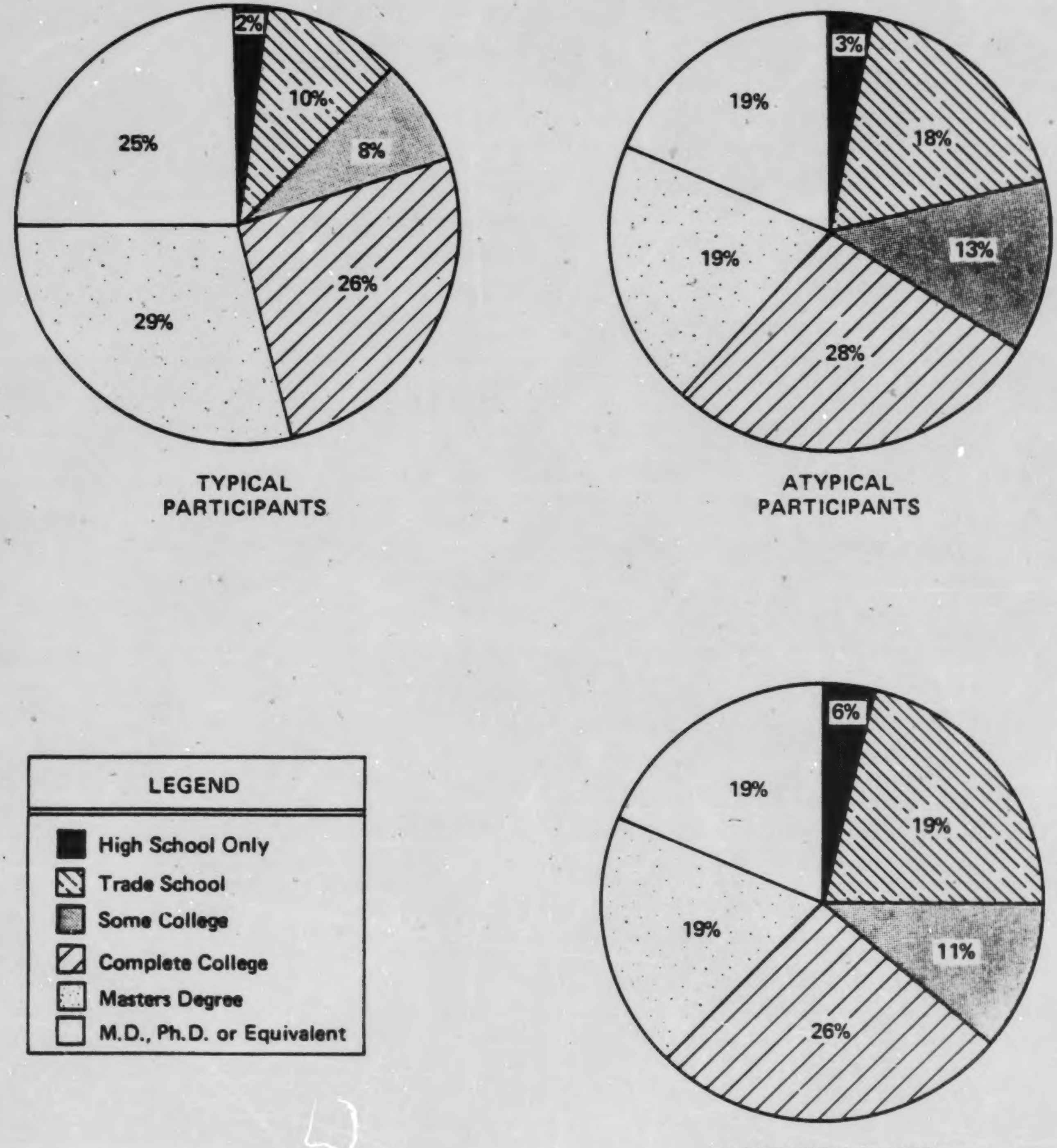

Figure 1. Educational aspirations as a function of Upward Bound participation pattern.

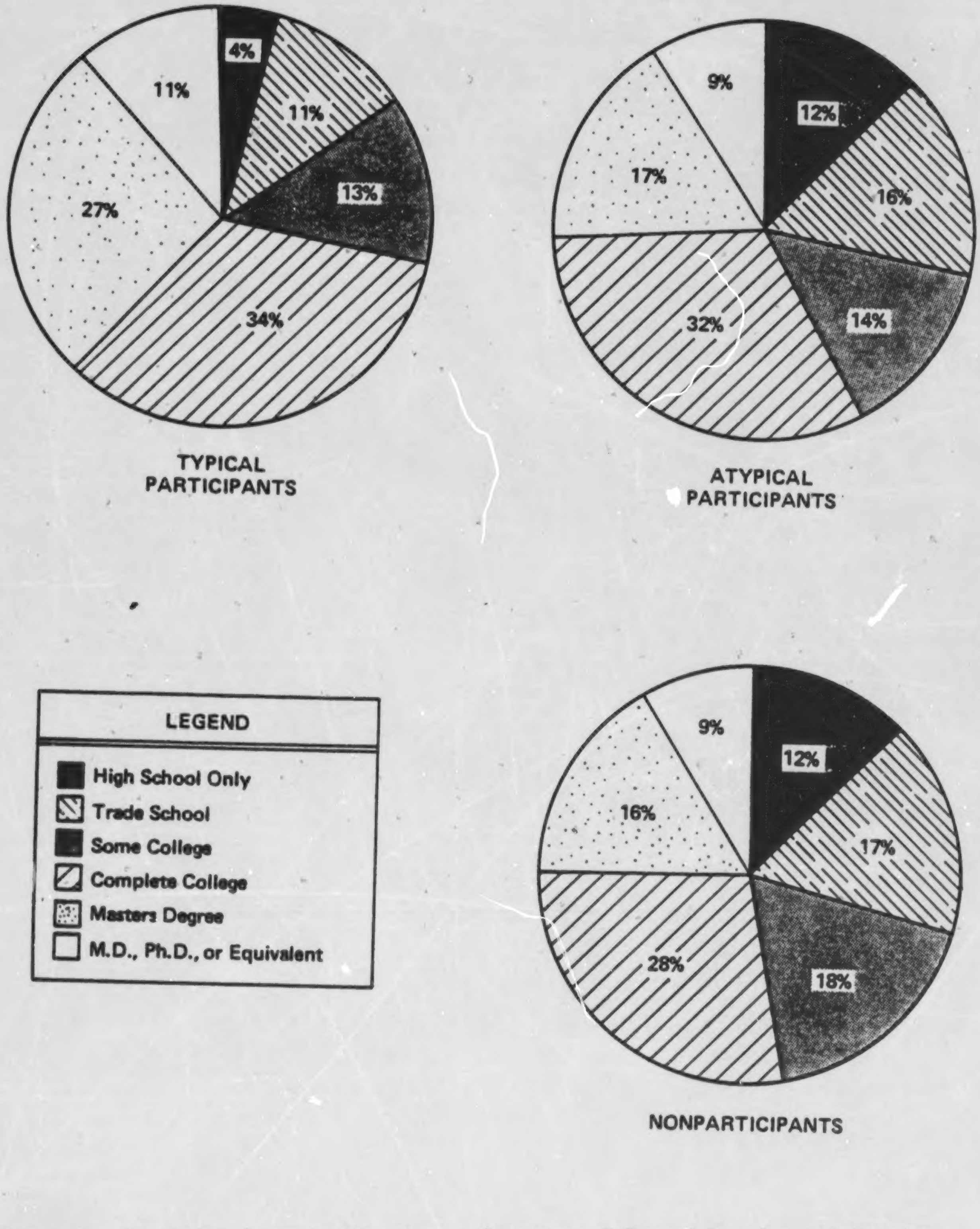

Figure 2. Educational expectations as a function of Upward Bound participation pattern.

of former participants have remained approximately the same.[66] Educational expectations, on the other hand, show an increase over time for both former participants and nonparticipants, with former participants (as a whole) maintaining a margin of higher expectations. The changes over time in aspirations and expectations may be due to a maturing of educational perceptions and/or successes experienced in continued education. The consistency over time of differences between former participants and nonparticipants, however, is a strong indication of the stability of this finding.

B. General Educational Progress and Persistence

Some measures of educational progress and persistence may be considered for the total sample (or major subsets thereof), including high school completion rate, PSE entry rate, (including direct and delayed entry), and progress/persistence in relationship to expressed educational goal. These outcomes are examined in this subsection.

1. High School Completion Rates

Completion of high school is a goal of the UB program and an important first milestone in the pursuit of postsecondary education. For purposes of analysis, high school completion was taken to mean either graduation, receipt of a high school equivalency diploma or certificate, or entry into some form of PSE.[67]

High school completion rates for all participation pattern groups were quite high. For the combined (typical and atypical) participant group, completion percentages were 96, 97, and 99 for the tenth-, eleventh-, and twelfth-grade cohorts, respectively; corresponding percentages for nonparticipants were 93, 96, and 96 (see Table H.6). Although the completion rates of participants were uniformly greater than those of nonparticipants, differences are quite small and are statistically significant only within the twelfth-grade cohort.

The second follow-up high school completion results are consistent with those from the first follow-up study, although the passage of additional time is associated with a general increase in the completion rate for all groups.

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[66] The trend for aspirations is based on only two time points, since that construct was not measured in the first follow-up study.

[67] PSE entry was included in defining high school completion since postsecondary institutions frequently accept successful completion of courses at another PSE institution in lieu of a high school diploma or equivalency certificate.

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High school completion percentages for UB participants during the first follow-up study were 81, 93, and 96 for those in the tenth-, eleventh-, and twelfth-grade cohorts, respectively. Comparable first follow-up percentages for the nonparticipants were 80, 86, and 96. It can be seen that cohort differences in high school completion are less marked for the second follow-up results. The remaining cohort differences probably reflect the fact that high school attrition is greater over a three-year period (tenth-grade cohort) than over a two-year period (eleventh-grade cohort), which, in turn, is greater than attrition over a one-year period (twelfth-grade cohort).

Within each grade cohort, two general results related to pattern of UB participation were observed (see Table H.6). First, former UB participants who did not participate during the twelfth grade showed completion rates that were similar to those of nonparticipants. Second, virtually all (99 percent or more) of the former participants who actively participated during the twelfth grade completed high school.

Thus, there is some suggestion that UB participation may enhance the likelihood of high school completion; however, the completion rates are quite high for all groups, and the differences associated with participation pattern are quite small. The small differences easily could be artificial, since "typical" UB participants progressed into the twelfth grade by definition, while such progress is not assured for other participation pattern groups.

2. PSE Entry Rates

Entry into PSE is a goal of the UB program, as well as a milestone in educational progress/persistence. In examining this outcome, analyses were conducted only for those who were classified as having completed high school.[68] Figure 3 shows PSE entry rates, within each grade cohort, for five patterns of UB participation.[69] The figure represents combined results from separate analyses of overall PSE entry rate and of rates of delayed (lag) entry among those who entered (see Tables H.7 and H.8).[70]

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[68] While the analysis is based upon a response-defined subgroup (with some attendant loss of statistical power), it is considered a more meaningful comparison, since it was desirable to remove from the findings, as much as possible, the directionally constrained relationship between UB participation pattern and high school completion (see Appendix H).

[69] The figure emphasizes the incomplete nature of the crossing of this definition of participation pattern with grade cohort.

[70] Direct and indirect entry rates were determined as a function of (1) the overall rate of PSE entry, and (2) the rate of delay given PSE entry.

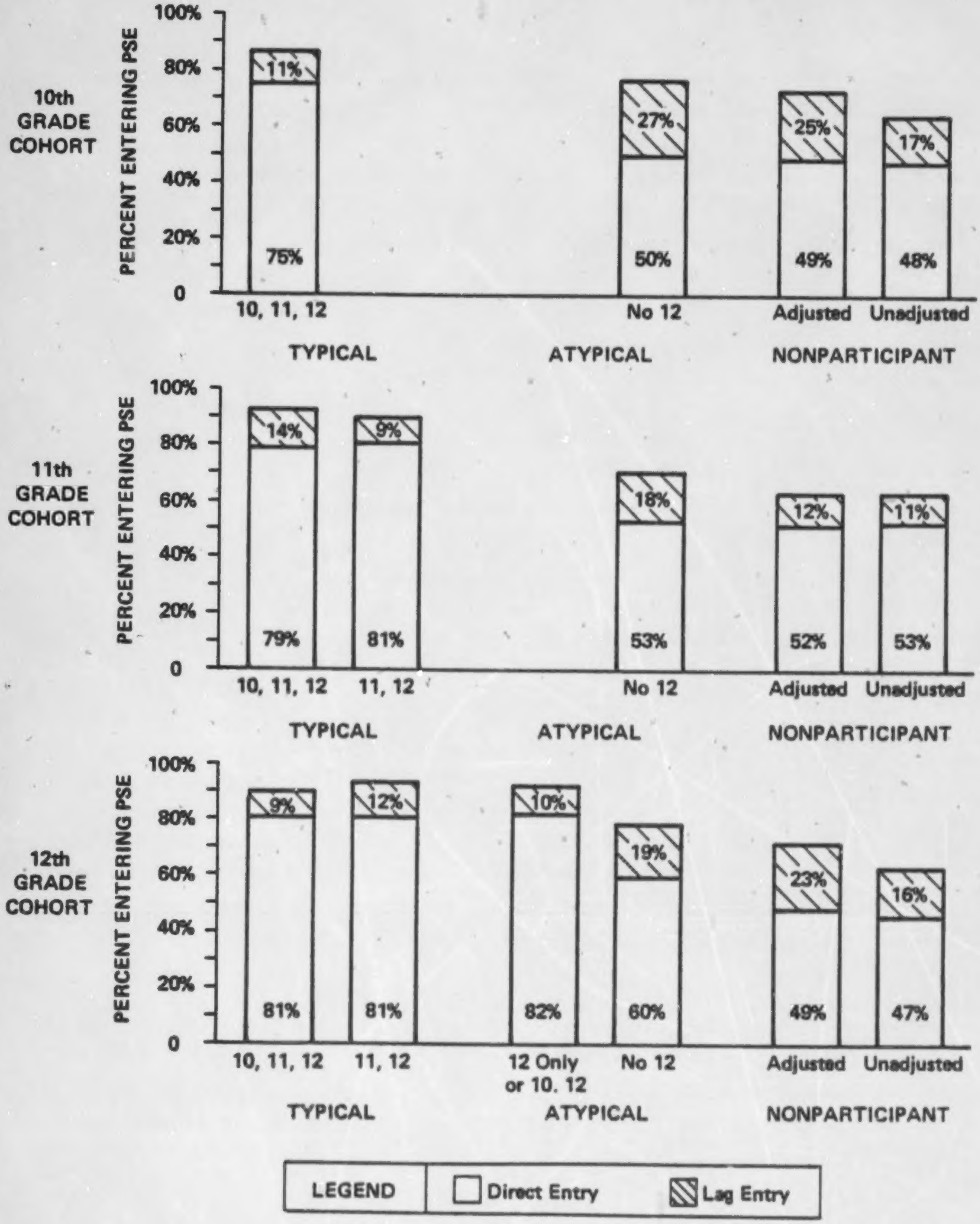

Figure 3. Postsecondary entry rates as a function of pattern of Upward Bound participation and grade cohort.

A general pattern of results is observed within all three grade cohorts. First, former UB students who did not participate in the twelfth-grade exhibit PSE entry rates, both direct and delayed, that resemble more the rates for nonparticipants than rates for other participants. Second, the PSE entry rates for those who participated in the UB program in the twelfth grade are quite high (86 percent or greater in all cohorts). Finally, direct entry rates among those who participated in the twelfth grade are also quite high (75 percent of greater in all cohorts).

The combined PSE entry percentages for all UB participants in the tenth-, eleventh-, and twelfth-grade cohorts (not shown in Figure 3) are 82, 83, and 88, respectively. Corresponding percentages for the nonparticipants are 74, 64, and 72, although the difference in the tenth-grade cohort is not statistically significant. Differences in PSE entry rates between typical participants and nonparticipants are most pronounced.

The combined second follow-up rates of PSE entry show an increase from the rates obtained in the first follow-up study. First follow-up PSE entry percentages for the tenth-, eleventh-, and twelfth-grade cohorts were estimated as 68, 73, and 79, respectively; corresponding percentages for nonparticipants were estimated as 49, 58, and 61. Combined first follow-up rates for the twelfth-grade cohort are comparable to the second follow-up rates for the tenth-grade cohort. Since the two cohorts considered were about equally removed from high school at the two associated time points considered, there is some indication of stability of PSE entry rates over time. The slightly higher rates in the second follow-up may be explained readily through one or more of the several areas for potential estimation errors discussed in Chapter 2.

Even though differences in overall (direct and delayed) PSE entry rates among participants (as related to pattern of participation) is strongly suggested by the results, statistical tests indicated significant differences between "typical" and "atypical" participants only within the eleventh-grade cohort. Within the eleventh- and twelfth-grade cohorts, the differences between the two typical pattern groups were not significant, and, within the twelfth-grade cohort, no difference was found between the two atypical pattern groups.[71]

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[71] The power of the test performed in this case was restricted by the small number of cases falling within the "twelfth-grade only or tenth- and twelfth-grade" pattern group.

When considering the rates of direct PSE entry (i.e., entry into PSE immediately on completion of high school or with only an intervening summer) differences among the various participation pattern groups are more pronounced. Statistical tests were performed for differences in the rates of direct entry, among those who entered.[72] Within the tenth-grade cohort, the direct entry rate of typical participants was significantly greater than for either atypical participants or nonparticipants. Within the eleventh-grade cohort, direct entry rates of typical participants differed significantly from that of atypical participants; however, the difference between the two typical participant groups was not significant, nor was the difference between the full participation group (participation in grades 10, 11, and 12) and the nonparticipant group. Within the twelfth-grade cohort, the full participation group differed significantly from the nonparticipant group, but not from the other typical pattern group; the two atypical pattern groups differed significantly and, in aggregate, the typical participants differed from the atypical participants.

The computation of lag entry for the current study differed considerably from that employed in the first follow-up and, consequently, direct comparisons across the surveys are not possible from the figures provided. The construct considered in this study (Table H.8) represents the proportion of delayed entrants among those who entered PSE.[73] The lag entry variable reported in the first follow-up study was the percentage of those not entering PSE directly who entered subsequently. First follow-up findings indicated that this rate was greater for participants (62 percent) than for nonparticipants (36 percent). Analogous percentages may be obtained from the values given in Figure 3.[74] These derived rates indicate that 53 percent of the participants in the twelfth-grade cohort who did not enter PSE directly entered subsequently; the corresponding value for the nonparticipants is 38 percent, which is consistent with first follow-up results.

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[72] The actual test was for the proportion of those entering that were delayed see Table H.8); however, within such a dichotomy, the test of one proportion is completely redundant with the test for the other proportion.

[73] A function of this proportion was computed for the estimates reported in Figure 3, which represents the percentage of those completing high school who showed delayed entry into PSE.

[74] The function is lag entry percentage, divided by 100 minus direct entry percentage.

A final noteworthy feature of Figure 3 is the unadjusted PSE entry rates for the nonparticipant group. The analytic technique employed in this study allowed computation of both adjusted and unadjusted rates for the nonparticipant group (only adjusted rates had been produced in previous studies). The nonadjusted rates provide estimates of PSE entry for the total population of nonparticipants who were in the same high schools with former participants at the time of original sample selection. Two features of these rates are of interest. First, the unadjusted rate for nonparticipants within each cohort is approximately 64 percent. This rate is comparable to national estimates from the National Longitudinal Study of the High School Class of 1972, who, like the twelfth-grade cohort, were four and one-half years out of high school.[75] Second, adjustment of the PSE entry rates within the nonparticipant group typically yielded upward adjustments of the rate. At first glance, this result may appear somewhat counterintuitive, given that the comparison group contained relatively fewer poverty-level students, academic risks, and minority students (see Table H.1). Two general findings on PSE entry shed additional light on this apparent anomaly. Given the overall depressing effect of lower SES on PSE entry, within a particular SES classification, minority group members tend to attend college at higher rates than majority group members.[76] Similarly, within a given ability level (as reflected in the academic risk variable) minorities exhibit higher PSE entry rates.[77] Under such circumstances, it is less surprising that the adjustment process employed (which did not allow for interactions) led to the upward adjustment of PSE entry rates.

3. Progress Toward Educational Goal

Educational progress/persistence is best defined in terms of educational goals. Such a measure of progress was constructed for the second follow-up, expressing current progress as a percentage of total progress necessary to reach the individual's reported educational aspirations (see

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[75] Eckland, B. K. & Wisenbaker, J. M. National Longitudinal Study: A Capsule Description of Young Adults Four and One-Half Years After High School. (Report No. RTI/884/51-01S). Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, February 1979.

[76] Ibid.

[77] Peng, S. S. & Holt, M. M. National Longitudinal Study: Tabular Summary of the Second Follow-up Questionnaire Data (Two and One-Half Years After High School), Volume I. Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, August 1977.

Appendix E). Using this variable, differences among UB participants and nonparticipants were examined among those aspiring to more than a high school education.[78]

The average percent progress toward educational goal of typical participants, atypical participants, and nonparticipants is given in Figure 4 for each of the grade cohorts (see also Table H.9). Within all three grade cohorts, typical UB participants have progressed further toward their goals than either atypical participants or nonparticipants; however, the difference between typical participants and nonparticipants in the tenth-grade cohort is not statistically significant. The greater goal-related progress of typical participants is even more impressive, in light of their higher aspirations.

The pattern of progress across grade cohort (which may be taken as a proxy measure for time since high school completion) is not clearcut. Goal-related progress generally increases over time, but the increase is neither dramatic nor consistent within participation pattern group. Statistical tests of cohort differences were not conducted and potential aspiration differences among cohorts (though not expected) were not examined; consequently, interpretation of the cohort differences are not considered appropriate here.

C. Deterrents to Education

Individuals may encounter many problems in attempting to accomplish their educational goals. Differences were examined for eight potential problem areas: (1) poor grades, (2) poor high school preparation, (3) lack of personal or family finances, (4) inadequate financial aid, (5) unavailability of desired program, (6) family responsibilities, (7) lack of information on desired program, (8) lack of information on educational requirements for desired careers.

Substantial numbers of participants and nonparticipants reported having experienced each of these problems in obtaining their desired education. The area least likely to generate education-related problems was unavailability of desired program, but even this area was perceived as a problem, to some extent, by about one-third of the participants and nonparticipants (Table H.14). Almost half of the participant and nonparticipant groups reported having

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[78] Comparisons within this restricted group were considered to be more meaningful and, given the extremely high rate of high school completion and the low rates of aspiring to only high school completion, this restriction was not considered severe.

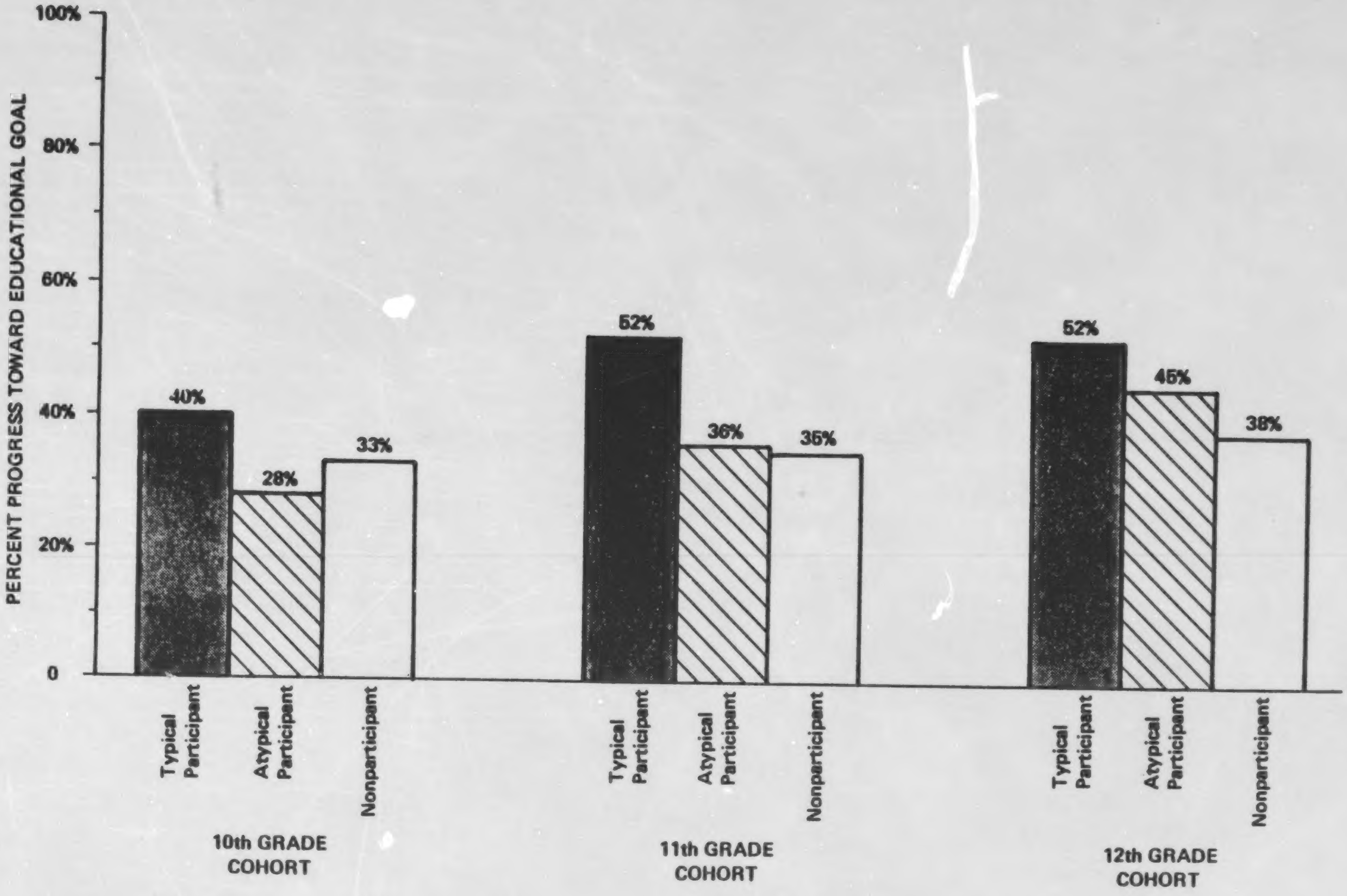

Figure 4. Average percent progress toward educational goal as a function of Upward Bound participation pattern and grade cohort.

experienced some problems with family responsibilities or with lack of information on desired program or career (Tables H.15 through H.17). Inadequate financial aid was also reported as a common problem area by over half of the typical participants, atypical participants, and nonparticipants (see Table H.13). No statistically significant differences were observed among the three participation pattern groups in either the percentage experiencing the problem or the extent to which the problem was experienced in any of these areas.

The problem reported most frequently as contributing to education-related problems was lack of personal or family finances, reported by 75 percent of the typical participants, 73 percent of the atypical participants, and 64 percent of the nonparticipants. The typical participant and nonparticipant groups differed significantly both in terms of the percentages reporting such problems and in the extent to which these problems were experienced (see Table H.12). Poor grades also represented a problem area for all three groups; typical participants (65 percent) experienced such problems at significantly higher rates than atypical participants (55 percent) or nonparticipants (58 percent), and also differed significantly from both groups in the extent to which this area represented a problem (see Table H.10). Finally, typical participants reported problems related to poor high school preparation (57 percent) at a significantly higher rate than nonparticipants (48 percent) but did not differ significantly from atypical participants in this respect (see Table H.11).

Inasmuch as the questionnaire item on which these results are based specifically linked the problem areas to obtaining one's desired education, typical participants might be expected to experience more problems, since they have higher educational goals. Yet, even though they report having experienced some problems in greater relative numbers than either nonparticipants or atypical participants, they have still progressed further toward their goals. This may indicate that they have been more successful in dealing with the problems. On the other hand, as an individual progresses further toward an educational goal, that individual may be more likely to encounter problems. In addition, because UB participants receive considerable counseling in circumventing education-related problems, they may be sensitized to these potential problems. This could also explain the differences between typical and atypical participants, since a great deal of this counseling occured during the twelfth grade at the time of the base-year study (all but one of the atypical patterns exclude twelfth-grade participation).

The first six of the problem areas were also examined during the first follow-up study; however, while the direction of the findings is relatively consistent, the results from the former study differ substantially from those reported here. Much lower proportions of individuals (both participants and nonparticipants) reported problems in these areas during the first follow-up study. While some of the increase may be attributable to increased exposure due to greater progress, the increase may reflect nothing more than better measurement of the constructs in the current study.

D. Other Outcomes

As suggested earlier, ultimate UB program goals extend beyond PSE-specific outcomes and relate to the potential for a more satisfactory and fulfilling life through enhanced educational opportunities. Two measures relating to these long-range goals (current employment status and satisfaction with current lifestyle) were examined in the second follow-up study and are reported in this subsection.

1. Current Employment

Employment status of participants and nonparticipants was considered for: (a) those currently not enrolled in school and (b) those currently enrolled in any PSE institution (full-time or part-time).[79] Among those not currently enrolled, participants reported significantly higher unemployment rates (27 percent) than nonparticipants (18 percent), but rates for typical and atypical participants (26 percent) were not significantly different (see Table H.18). Among those employed, ratios of full-time workers to part-time workers were about five to one within all participation pattern groups. Among those currently enrolled, about half of the participant groups and the nonparticipant group were not working. Further, typical participants and nonparticipants showed approximately equal rates of full-time and part-time work;

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[79] Although the partitioning reduces statistical power, it was considered important for meaningful comparisons, since an employment status difference within one partition would lead to considerably different interpretation than the same difference within the other partition. For example, the state of unemployment within the currently enrolled partition could reflect a better overall grant and loan package, but within the not enrolled partition, it could refect the inability to obtain a job.

however, the work distribution for atypical participants was more heavily weighted toward full-time employment (about two to one), which differed significantly from the distribution for typical participants. These results are generally consistent with first follow-up findings.[80]

There are several possible interpretations of the higher unemployment rate among former participants in the nonenrolled group. One reasonable interpretation relates to the fact that former participants enter PSE at higher rates, and, as a result, larger percentages of the former participants may have been "between schools" during the survey than nonparticipants. A larger percent of the nonparticipants have not attended PSE at all, and thus have had longer periods to find employment or to gain work experience. Still another possibility is that the non-enrolled former participants represent a subgroup that has failed to utilize the special opportunity the UB program has afforded, and who may not push very hard for other opportunities offered by the society at large. Differences in working full- or part-time among typical and atypical participants who were enrolled may indicate that those in the former group may be receiving more grants and loans, and thus proportionally fewer require the support of full-time work.

2. General Satisfaction

The quality-of-life construct reflects one of the superordinate goals of the UB program.[81] The second follow-up survey questionnaire attempted to measure this construct through a five point scale of the individuals' satisfaction with what they were currently doing (see Appendix D). For purposes of this analysis three subgroups were considered: (a) those who never entered PSE, (b) those who entered PSE but who had not graduated, and who were not currently enrolled, and (c) those who had graduated from, or were currently enrolled in, PSE.

Analysis results are given in Figure 5 (see also Table H.19). In general, satisfaction is lowest for individuals who entered PSE, did not graduate, and are not now enrolled; satisfaction is highest within the subgroup that graduated from or were currently enrolled in PSE. The only statistically significant differences indicated were: (a) between typical participants and atypical

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[80] Typical and atypical pattern differences were not examined in the first follow-up survey and comparison across studies for this dimension are not possible.

[81] While this construct has been considered by social scientists for some time, a large number of measurement problems are considered by RTI as not yet satisfactorily resolved.

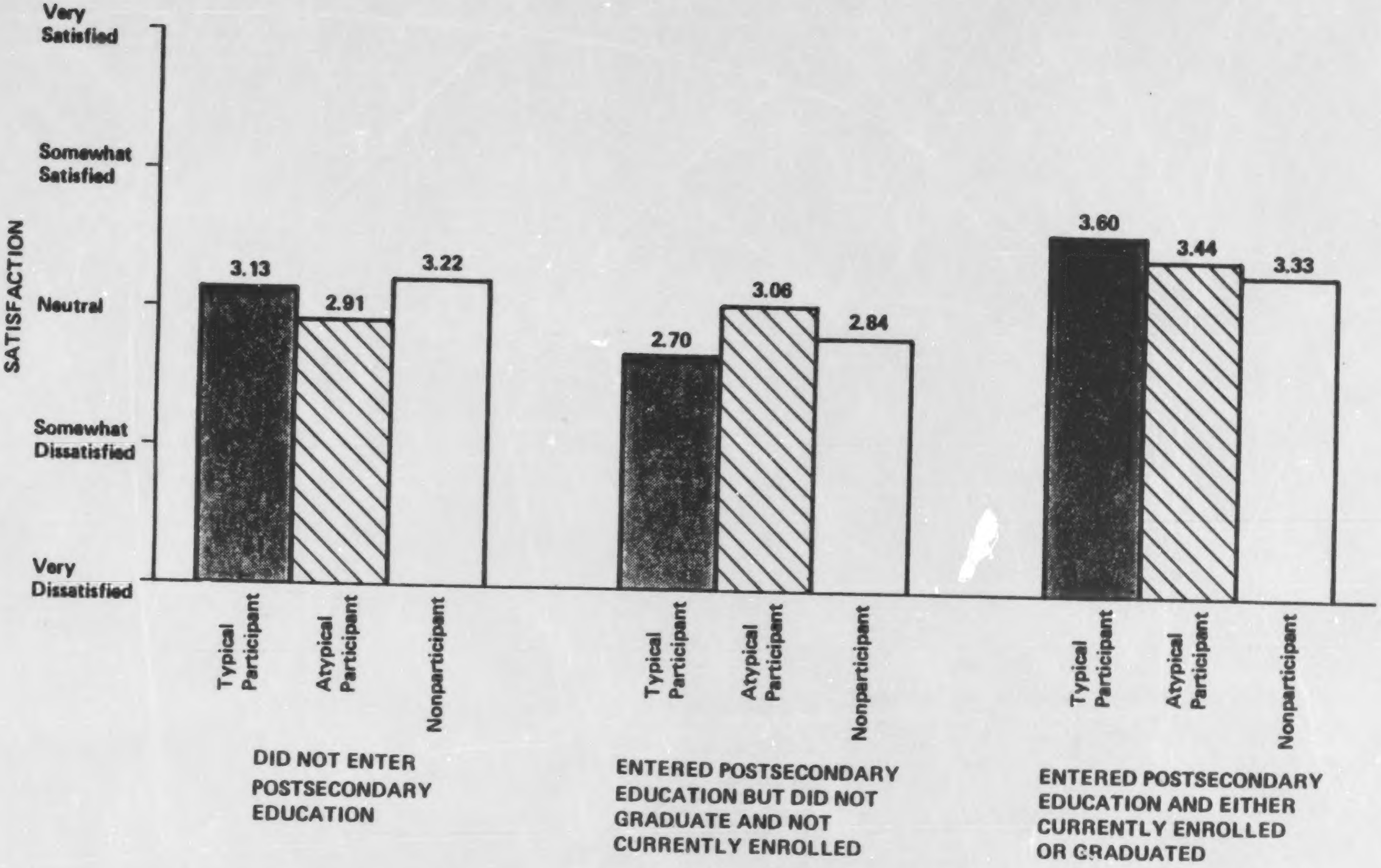

Figure 5. General satisfaction as a function of Upward Bound participation pattern and current postsecondary education status.

participants in the not graduated or enrolled group, and (b) between typical participants and nonparticipants in the graduated or enrolled group. In light of the small observed differences and the imprecision in measuring this construct, interpretation of these findings is not warranted.

III. OUTCOMES RELATED TO THE GENERAL PSE SETTING

A logical extension of the investigation reported in the previous section would be to examine the subsequent educational progress/persistence and performance for individuals who entered some type of postsecondary school; however, PSE progress/persistence or performance may be influenced by the particular PSE "setting" and experience. Therefore, attention will be directed first to the types of PSE institutions attended by UB participants and nonparticipants and to their experiences with relevant support services and financial aid. Analyses were conducted only for those individuals who entered PSE. The background characteristics of PSE entrants are shown in Table H.20.

A. Types of PSE Institutions Attended

The characteristics of those PSE institutions currently or last attended that were considered are: student body family income, selectivity, average per-student cost, size, predominant ethnicity of student body, level of offering and type of control, and institutional host status for both UB projects and Special Services for Disadvantaged Students (SSDS)[82] projects. These analyses were conducted separately for each institutional index.[83] Such analyses are not independent, since the institutional indices are related; thus, the statistical levels of significance for the several tests may underestimate the likelihood of chance differences.[84] Nonetheless, the approach taken was considered to provide the most meaningful available analytic strategy.

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[82] The SSDS program is a federally-funded educational intervention program for college-level students. This program, together with the UB and Talent Search programs for high school students, constitute what are frequently called the Trio programs.

[83] The analytic approach to this investigation involved categorizing sample members by type of institution attended and using sample weights to estimate the population distribution of PSE-entering students among the various types of institutions. Contrasts of differences in the distribution of typical and atypical former UB participants and of typical participants and nonparticipants were then formed. This procedure was employed separately for each of the specific indices considered. All comparisons reflect aggregation over grade cohort, since there were no empirical or theoretical reasons to suggest grade cohort differences. Control for possible grade differences was provided, nonetheless, through covariance adjustments.

1. Student Body Family Income

An index of the family income level or socioeconomic status (SES) of the student population was used to classify PSE institutions attended by sample members into three categories: low SES, middle SES, and high SES.[85] No significant differences were found among the attendance patterns of UB participants and comparable nonparticipants for any of the three institution types defined by this measure.[86] About 60 percent of the UB participants and nonparticipants attended schools classified as having low student body family income, whereas no more than 7 percent of the individuals in any group attended high SES schools (see Table H.21).

2. Institutional Selectivity

Three categories of relative institutional selectivity were defined--low, intermediate, and high--based on the average scores of entering students on standardized admissions tests. Patterns of attendance among typical UB participants, atypical participants, and nonparticipants differed significantly within all three institutional selectivity classification levels. Although substantial percentages of all participation pattern groups attended low selectivity institutions, a significantly greater percentage of nonparticipants (70 percent) attended such schools than did typical UB participants

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[84] For example, student body family income at an institution is related to average cost per student; institutions with low student body family income are typically also those with low per-student costs. Any observed differences between the attendance rates of participants and nonparticipants in regard to the student body family income at an institution would therefore be at least partially reflected in differences in institutional costs.

[85] This index and other PSE indices were developed by USOE. For a definition of rules used in forming the indices, see Carroll, C. D., Characteristics of Postsecondary Education Institutions: Computer File Version 7907 (USOE Technical Paper 79-12). Washington, D.C.: U.S. Office of Education, June 1979.

[86] This finding is not completely congruent with first follow-up findings of a significant difference in the percentage of former UB participants and nonparticipants attending low SES institutions; however, the first follow-up estimates were attenuated by the large number of schools that were unclassifiable because of the considerable indeterminacy in the institutional characteristics data. The same problem of indeterminacy existed in other first follow-up findings; as a result, most comparisons across studies are not completely justifiable.

(58 percent); this difference in attendance pattern was reversed for intermediate selective schools. Significant differences in attendance rates at high selectivity schools were also indicated between the two participant groups; 18 percent of the typical participants, as compared to 12 percent of the atypical participants, reported attending such schools (see Table H.22).

3. Average Per-Student Cost

Five categories of composite institutional cost were established by this index: less than $500; $500 to $999; $1,000 to $1,999; $2,000 to $3,999; and $4,000 or more. No difference in attendance pattern of typical participants and atypical participants was indicated for this institutional characteristic. The only statistically significant difference existed in the percentages of typical participants and nonparticipants attending the most costly institutions (i.e., $4,000 or more); however, the rate of attending such institutions is so low (less than three percent of each group) that differences have little practical meaning. No other significant differences between the attendance rates of the three groups in respect to institutional cost were obtained. The vast majority (over 80 percent) of former UB participants and nonparticipants attended schools costing less than $2,000 (see Table H.23).

4. Institutional Size

Five classifications were defined by this index from number of full-time equivalent students at an institution: less than 500; 500 to 2,499; 2,500 to 7,499; 7,500 to 14,999; and 15,000 or more. Significantly different patterns of attendance among former UB participants and nonparticipants occurred only in the two smallest institutional size categories. While nonparticipants (22 percent) attended the smallest schools at significantly higher rates than typical participants (9 percent), the attendance patterns for these groups was reversed in the second smallest school category. Practically speaking, therefore, it is probably more reasonable to conclude that roughly the same percentages (slightly less than half) of the participant and nonparticipant groups attended schools with less than 2,500 students (see Table H.24).

5. Predominant Ethnicity of Student Body

Two categories were used for this analysis: predominantly or traditionally nonwhite institutions, and all other institutions.[87] Essentially the same percentages of atypical UB participants and nonparticipants had attended institutions classified as having predominantly nonwhite student bodies (17 percent and 18 percent, respectively), but a significantly greater percentage of the typical participants (30 percent) had attended such institutions (see Table H.25). This finding is consistent with first follow-up results. Although the percentage of typical participants attending traditionally nonwhite institutions was substantially higher than that of nonparticipants, the difference may be attributable to the relationship of this institutional index to the UB host status of the institution and not to any racial preference between the groups.[88]

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[87] Although classification of predominant ethnicity of school was available for black, Hispanic, and native American minority groups, low base rates of attending schools within the latter two categories led to a collapsing of these classifications.

6. Institutional Control and Level of Offering

Type of control and highest level of program offered were partially crossed, to define five institutional categories: vocational/technical or business, public two-year, private two-year, public four-year, and private four-year. Considering type of control, the majority of former UB participants and nonparticipants attended public institutions (see Table H.26). Rates of attending private two-year institutions were quite low (less than three percent, and less than one-tenth the rates of attending public two-year institutions) and statistically equivalent for the three participation pattern groups. Attendance at private four-year institutions was greater in both an absolute and relative sense (about one-half to one-third the rate of attending public four-year institutions). Typical participants attended private four-year institutions at significantly higher rates (27 percent) than either nonparticipants (14 percent) or atypical participants (19 percent).

The distributions of participation pattern groups over three types of institutional offerings are shown in Figure 6. With the exception of two-year colleges, differences in attendance patterns of typical participants, and those of atypical participants and nonparticipants, are statistically significant. Approximately half of the atypical participants and nonparticipants attend two-year colleges or vocational/technical schools, with the other half of each group attending four-year colleges or universities. In contrast,

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[88] As shown in subsection III.A.7, typical participants attended UB host institutions in much greater relative numbers than either atypical participants or nonparticipants, and greater percentages of the predominantly nonwhite institutions serve as hosts for the UB programs than do predominantly white schools.

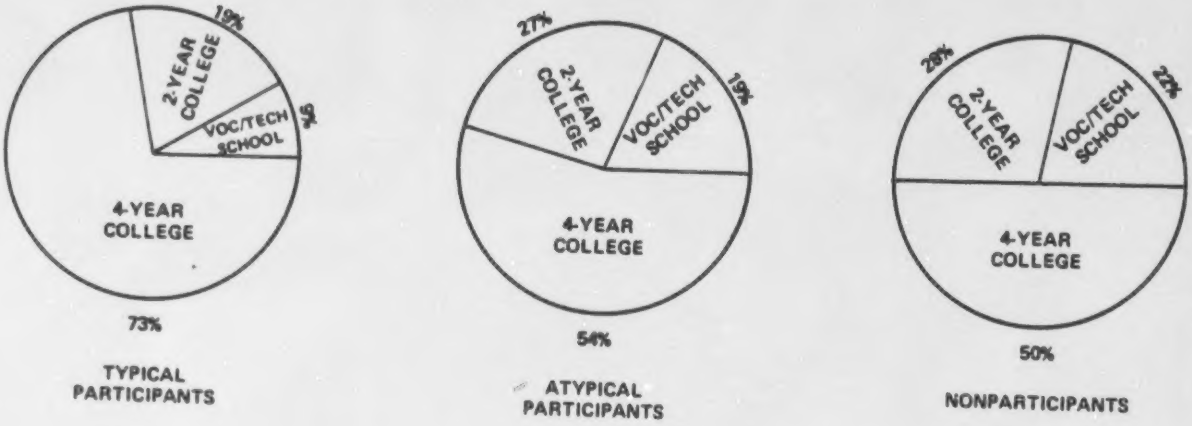

Figure 6. Level of offering of institution last attended as a function of Upward Bound participation pattern.

almost three-fourths of the typical UB participants attended four-year institutions, including almost half of the total group at public four-year institutions (Table H.26).

These different attendance patterns are consistent with the findings of the previous base-year and first follow-up studies, and reflect the implicit emphasis placed by the UB program on entry into a four-year college program, as opposed to a two-year or vocational program.[89] The differences between the typical and atypical former UB participants may reflect the placement function of the UB program, since placement activities were concentrated among twelfth-grade participants at the time of the base-year study and since the atypical participants are defined almost exclusively by lack of twelfth-grade participation.

Given the UB program emphasis on completion of a four-year PSE program and the recent growth in the number of two-year and community colleges, the transfer rates from two-year to four-year institutions were examined. The analysis was restricted to those who had initially entered two-year institutions. While former UB participants transferred from two-year to four-year institutions at slightly higher rates (20 percent) than nonparticipants (16 percent), these differences in transfer rates were not statistically different (see Table H.27).

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[89] Also, the great majority of UB programs are hosted by four-year institutions and, as shown in Subsection III.A.7, typical participants enter UB host institutions in substantially greater relative numbers than their nonparticipant counterparts.

7. Upward Bound and Special Services Host Status of Institution

For each program type (UB or SSDS), two categories of institutions were established: (1) institutions hosting projects at any time during the last five academic years and (2) institutions not hosting a project during that time. The rates of last attending UB or SSDS host institutions are presented in Figure 7 (see also Tables H.28 and H.29). More than half of the typical UB participants attended UB host institutions as compared to about a third of the atypical participant and nonparticipant groups. These significant attendance rate differences may be attributable to the host institutional commitment to the UB program and, consequently, admission of a large number of former participants.

Figure 7 also shows that differences in the attendance patterns of former UB participants and nonparticipants at SSDS host insitutions, though similar, were less substantial.[90] The percentage of each group attending SSDS host institutions was even higher than for UB host institutions. The higher percentage of typical participants as compared to atypical participants who attended SSDS host institutions was statistically significant; and, though not statistically significant, the difference in attendance rates for typical participants and nonparticipants is consistent with other findings.

B. Major Program of Study

To extend further the investigation of PSE settings, the relationship between UB participation pattern and student's major program of study was examined. Five major program areas were established (see Appendix E): (1) education and related fields, (2) humanities, (3) other nonscientific academic fields, (4) social sciences, and (5) natural sciences, engineering, and related fields. Analysis was restricted to those in the eleventh and

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[90] The fact that most UB host institutions also host SSDS projects probably accounts for a good part of the similarity of attendance rates.

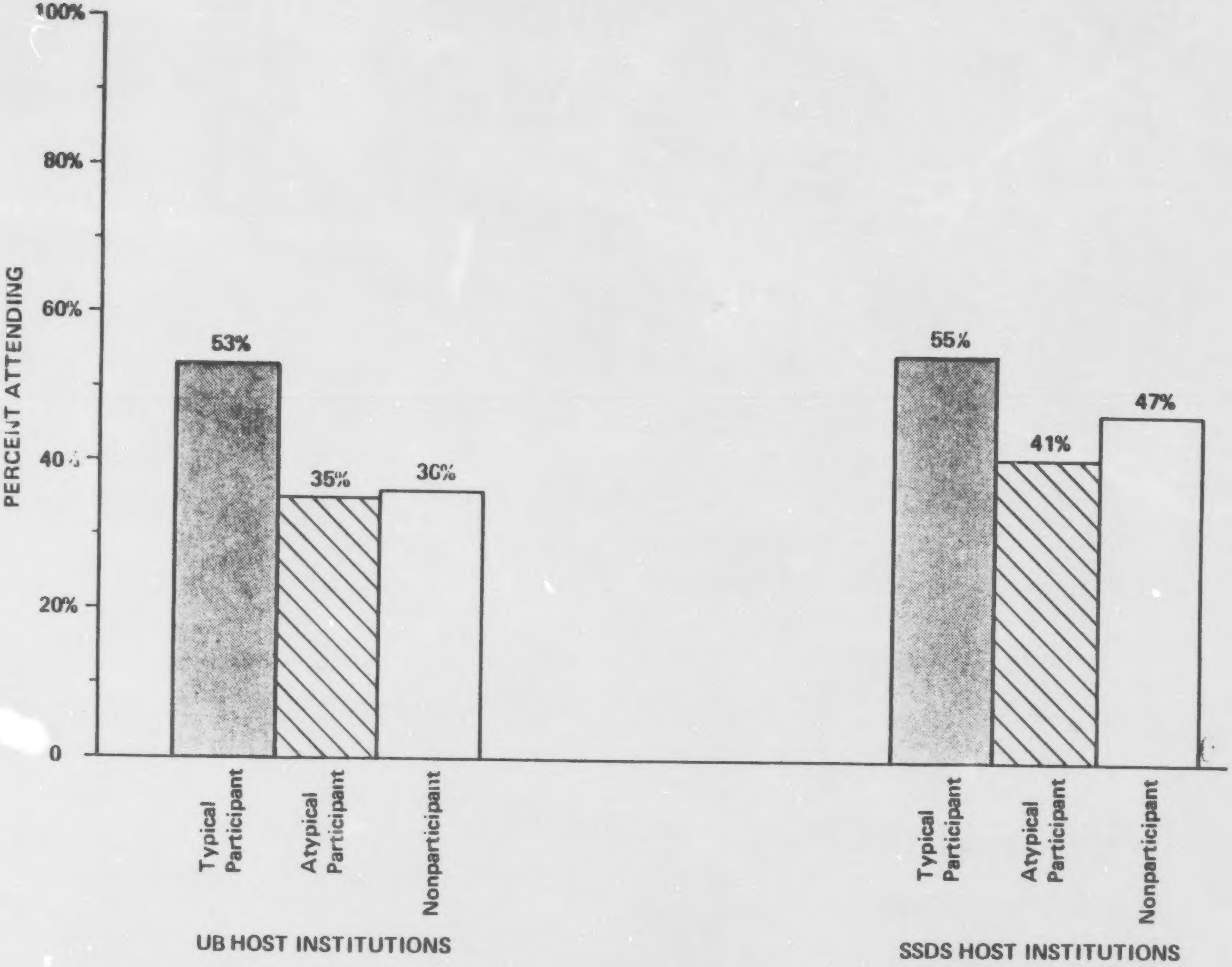

Figure 7. Attendance at Upward Bound and Special Services host institutions as a function of Upward Bound participation pattern.

twelfth grade cohorts who last attended a four-year PSE institution and, for that reason, cell sizes were very small.[91]

The major program of study of participants and nonparticipants is shown in Figure 8 (see also Table H.30). Two-thirds of the typical participants and nonparticipants were majoring in nonscientific program areas; these areas also accounted for the majority of atypical participants (60 percent). The percentage distributions of the former participant and nonparticipant groups did not differ significantly across the three nonscientific program categories. In contrast, there were significant differences in the science majors chosen by the groups, with only about 4 percent of the nonparticipants as compared to 16 percent of the typical participants and 22 percent of the atypical participants majoring in the social or behavior sciences.

These results are quite suspect (perhaps as a result of the small cell sizes[92] or from peculiarities of institutions at which the data were available for nongraduates). The seemingly low estimate of social science majors within the nonparticipant group (which is even smaller before adjustment) conflicts with much higher estimates of social science majors in the general population; for example, the National Longitudinal Study indicates that this figure is about 12 percent overall and closer to 15 percent for minorities.[93]

C. Availability of Support Services

A wide variety of special "support" programs and services, including tutoring, counseling, and various remedial courses are frequently available to students at PSE institutions. The availability of such programs and services

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[91] Sufficient time had not elapsed for a substantial proportion of the 10th grade cohort to have progressed to the point (typically the junior or third year of a four-year program) of declaring a major program area. Additionally, those last attending two-year colleges and vocational schools were excluded from this analysis because it was felt that, for such analyses, program differences at such schools were less meaningful in explaining differences in the PSE attainment measures. Finally, though weight adjustments were conducted in an attempt to compensate for indeterminacy of this variable, the analyses were effectively restricted to those attending the subset of PSE institutions that provided information on transcripts relevant to major course of study prior to the individual's graduation.

[92] Cell sizes were sufficiently small to violate some assumptions of the analytic model.

[93] Peng, S. C. & Holt, M. M., 1977 (op. cit.)

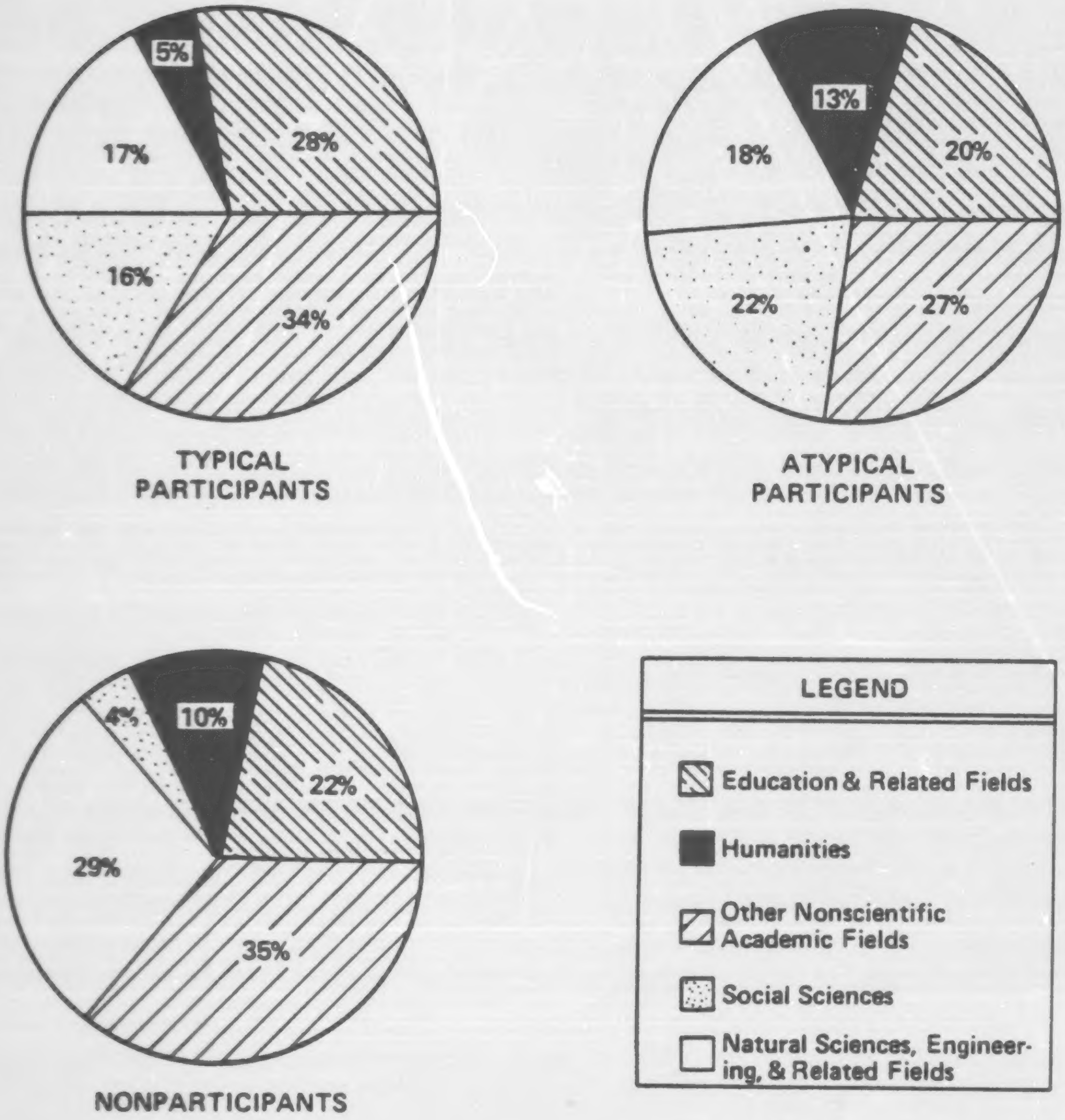

Figure 8. Declared major course of study as a function of Upward Bound participation pattern.

at the PSE institution last attended was examined. Separate analyses were conducted within categories of SSDS host status of the last attended institution, on the assumption that availability of services would be related to that institutional characteristic.

Over 90 percent (in most cases over 95 percent) of the participant and nonparticipant groups attending SSDS host institutions indicated availability of one or more specific services within each of three general types of services (tutoring, counseling, and remedial courses). No differences were indicated among participants and nonparticipants in the availability of these major service categories at SSDS host schools. Services within these major categories were also reported by each group as being quite commonly available at non-host institutions. For typical participants, availability rates were comparable for both SSDS host institutions and for non-host institutions, but availability rates within the atypical participant and nonparticipant groups were somewhat lower at non-host institutions. Only two significant participation pattern group differences were observed within the non-host institutions. The most substantial difference existed between the percentages of typical participants (92 percent) and nonparticipants (79 percent) reporting availability of tutoring services. This difference may be attributable to actual differences in availability of such services at the institutions attended by the two groups or to differences in the awareness of the groups regarding the existence of these services.[94] The other difference existed between typical participants (95 percent) and atypical participants (89 percent) in the availability of remedial courses (see Tables H.31, H.32, and H.33 for additional detail).

D. Participation in Available Support Services

As indicated in the previous section, some type of tutoring, counseling, and remedial instruction activity is generally available to both participants and nonparticipants attending PSE institutions. The extent to which students seek out and participate in various support services provided at the PSE institutions they attend was also examined. Analysis was restricted to PSE entrants who reported availability of the particular services at the institution last attended, and separate analyses were conducted on the basis of SSDS host status of institution last attended; results are detailed in Tables H.34, H.35, and H.36.

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[94] Given the compensatory nature of the services provided by the UB program, one would expect that, as a result of program participation, students would show greater awareness and sensitivity to special support services offered in PSE than would be expected had they not participated in the UB program. In fact, recognition of availability of services can be logically construed as a coping skill that is provided by the UB program.

In general, the demand for (or use of) available support services at both SSDS host and non-host institutions was greater among UB participants than nonparticipants; however, substantial percentages (53 to 80 percent) of all three participation pattern groups reported using each type of service (tutoring, counseling, and remedial instruction), to some extent. Moreover, for each participation pattern group at both host and non-host schools, the greatest demand was for counseling services. Typical participants generally reported greater use of available counseling services than nonparticipants but the difference was statistically significant only within SSDS host institutions, at which usage rates were 80 percent and 66 percent, respectively. Available tutoring services also were used by significantly greater percentages of typical participants (about 70 percent) than nonparticipants (about 55 percent) at both SSDS host and non-host institutions; rates of using available remedial instruction services were not significantly different (between 60 percent and 70 percent).

Few systematic differences were observed between the three participation pattern groups in terms of the frequency with which available support services were used. The only noteworthy difference was in the use of tutoring services provided at SSDS host institutions, where former typical participants reported a significantly higher average frequency of use of such services than nonparticipants.[95]

E. Financial Aid Received

For poverty level individuals, securing adequate financial assistance is an obvious requisite to entry and success in PSE. To help insure equal access and opportunity for higher education, a number of student financial aid programs have been implemented, most of which are targeted for students from low-income families. Generally speaking, these programs include three types of support: loans, college-sponsored work programs, and grants or scholarships. Loans and work programs provide an opportunity for self-help, but much of the financial burden remains on the student or his family (although most student loan programs carry low interest rates, at least while education continues). In contrast, programs that provide support in the form of grants or scholarships require no repayment or work obligations.

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[95] Averages were computed for a four-valued scaling of extent of participation (1 = did not participate, 2 = participated infrequently, 3 = participated occasionally, 4 = participated frequently).

One of the functions of the UB program is to help participants apply for and obtain adequate financial aid for PSE. Further, one of the coping skills that may be provided by the UB program relates to the ability of the individual to continue to be aware of available sources of financial aid. In this section, the sources and patterns of student financial support are examined.[96] Since the impact of financial aid is less likely to depend on the specific source of support than on the timing, form, or amount of aid received, these additional aspects of financial aid receipt will be examined in this section also.

1. Sources of Financial Aid

Figure 9 indicates the proportions of participants (typical and atypical) and nonparticipants receiving aid from specific aid sources. Greater detail concerning these and other sources of financial aid is provided in Tables H.37, H.38, and H.39, for specific types of grants and scholarships, loans, and earnings and savings, respectively. The most common type of student financial assistance for each group is in the form of grants or scholarships. Within this support category, the Basic Educational Opportunity Grant (BEOG) was by far the most frequently reported source of aid received, and typical participants reported receiving BEOGs at significantly higher rates than atypical participants or nonparticipants. Essentially the same pattern of aid receipt differences was observed with respect to Supplemental Educational Opportunity Grants (SEOGs), although a considerably smaller percentage of each group reported receiving such grants and, in this case, the rates for typical and former participants did not differ statistically.

Additional sources of grants and scholarships, not shown in Figure 9, were examined. About 10 percent of each of the three participation pattern groups reported receiving Social Security benefits, and about 4 percent received

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[96] The results reported in this section are based on aid received during the most recent year of PSE at the last school attended.

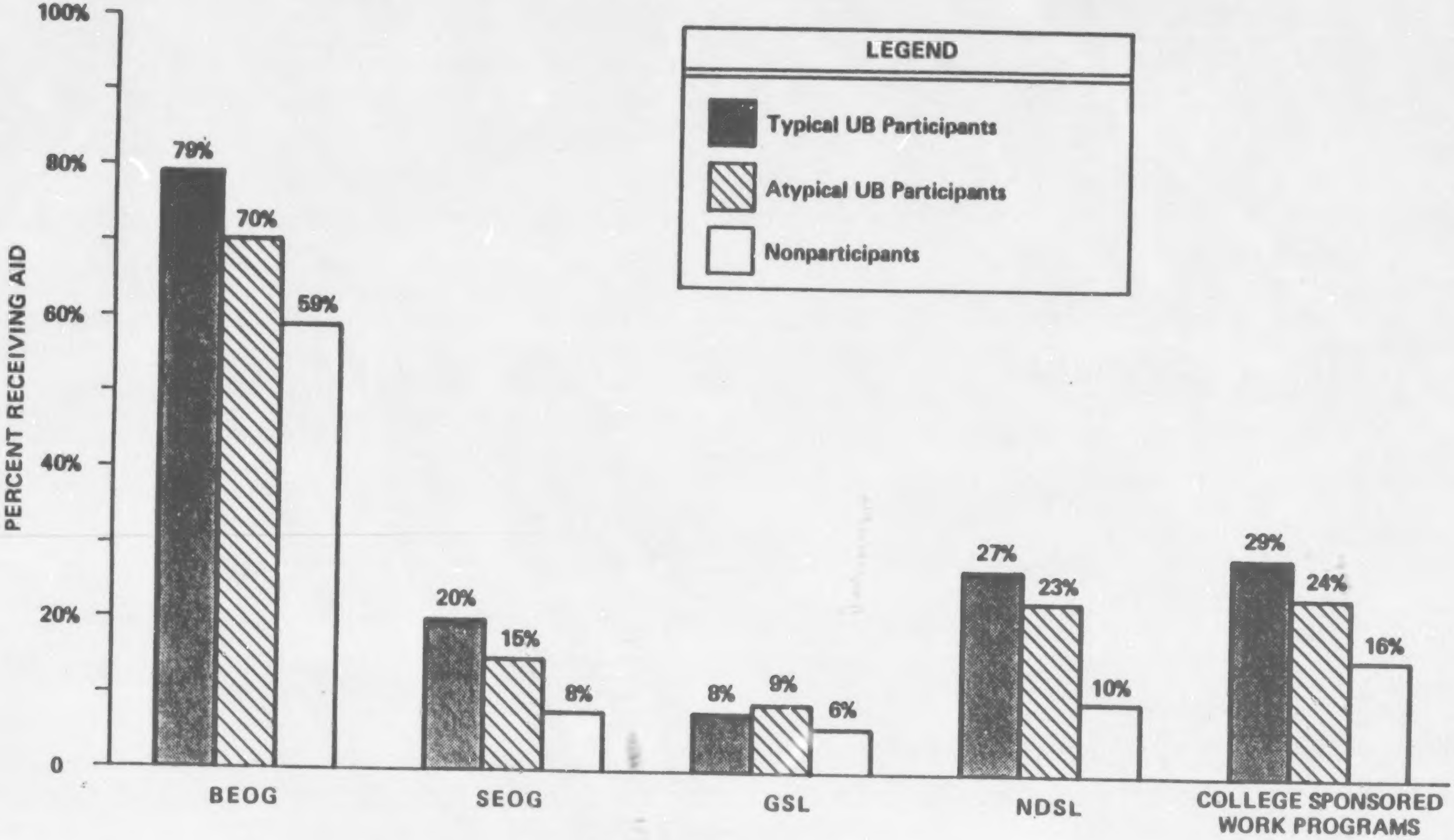

Figure 9. Specific sources of financial aid received as a function of Upward Bound participation pattern.

funds through Veteran's Administration programs. Relatively few students (2 percent or less) in each participation pattern group reported receiving funds from an ROTC scholarship or from other federal scholarship programs. Typical participants did report significantly higher rates (13 percent) of receiving state scholarships than atypical participants (7 percent); however, the rates at which nonparticipants received such funds (9 percent) did not differ significantly from the rates of former participants. Typical participants were also significantly more successful in obtaining funds within a separate category of "other scholarships and grants" (22 percent) than either atypical participants (14 percent) or nonparticipants (10 percent).

As displayed in Figure 9, former program participants also reported receiving National Direct Student Loans (NDSLs) at over twice the rate of nonparticipants. No significant differences were observed, however, with respect to receipt of other types of loans; less than 10 percent of the former participant and nonparticipant groups reported receiving Federal Guaranteed Student Loans (GSLs), and about 2 percent of each group (not shown in Figure 9) received state loans. Five to seven percent of each participation pattern group reported receipt of some other form of loan.

Nonparticipants also participated less frequently in college sponsored work programs than either typical participants or atypical participants. While not shown in Figure 9, no significant differences were indicated between the percentages of these groups using earnings or savings to finance their most recent year of PSE. About one-fourth of each group reported use of summer earnings, and about 16 percent reported use of earnings, while taking courses, from other than college work programs.

Since the former UB participant and nonparticipant groups attend different types of PSE institutions at different rates and since some financial aid programs and policies are known to vary by type of school, the distribution of aid received by each group was further examined within type of school (defined by level of offering). Results are shown in Figure 10 (see Tables H.40, H.41, and H.42 for additional detail).[97] While differences existed across school types in absolute percentages of students receiving specific categories of aid, a fairly consistent pattern of aid receipt existed across all three

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[97] It should be noted that cell sizes within the vocational/technical school category were relatively small and led to some violations of the assumptions of the analytic model; for this reason, results within that school type should be interpreted cautiously.

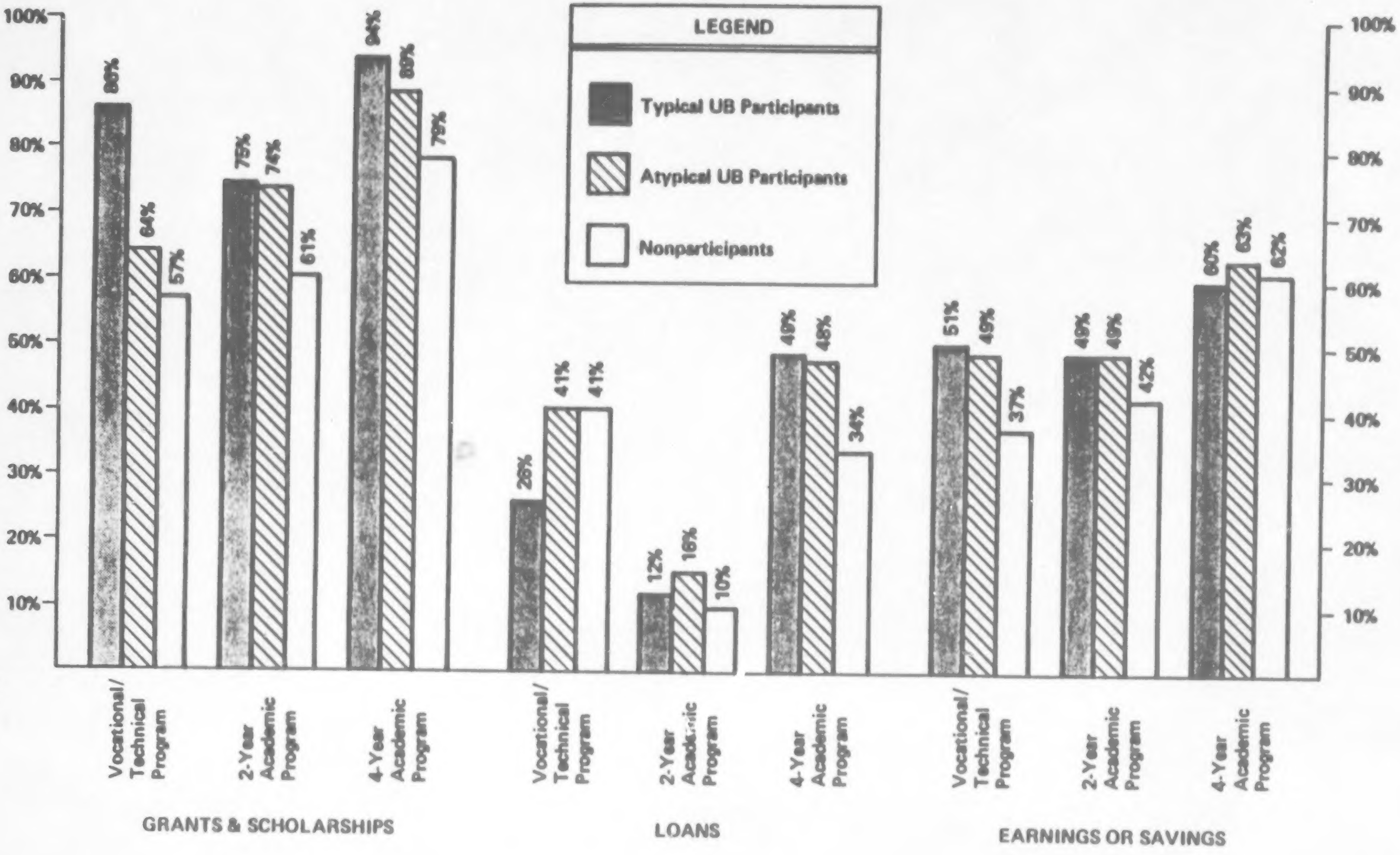

Figure 10. Receipt of financial aid within three major categories as a function of Upward Bound participation pattern and level-of-offering of school last attended.

school types. The most common financial support category for each participation pattern group, in all three types of school, is grants or scholarships. Further, within school type, UB participants received grants or scholarships at significantly higher rates than nonparticipants. On the other hand, no significant differences were obtained within any school type, between the percentages of participants and nonparticipants reporting receipt of some form of loan or the use of earnings or savings to finance their most recent year of PSE.

2. Packaging of Student Financial Aid

The total financial aid "package" received by a student typically consists of funds from one or more of the major aid categories discussed in the previous subsection. This subsection examines the financial aid packages received. For these analyses (see Table H.43), eight different categories or financial aid packages were established (see Appendix E): (1) family or others' contributions only;[98] (2) personal earnings or savings only; (3) loans only; (4) grants or scholarships only; (5) loans and savings or earnings; (6) grants or scholarships and savings or earnings; (7) grants or scholarships and loans; and (8) grants or scholarships, loans, and savings or earnings.

Almost two-thirds of the UB participants, compared to less than half (44 percent) of the nonparticipants, reported receiving aid packages consisting of two or more sources (almost always including grants as one of the sources). Typical participants (27 percent) received packages comprised of aid from all three major categories at significantly higher rates than atypical participants (21 percent) and nonparticipants (14 percent). Aid from grants or scholarships only was the most frequently reported single-source package for all three participation pattern groups; 29 percent of the typical and atypical participants and 19 percent of the nonparticipants indicated total support from grants or scholarships. About one-fourth of the nonparticipants indicated exclusive receipt of funds from either personal earnings or savings (14 percent) or family contributions (10 percent); corresponding percentages for typical and atypical participants were 8 percent and 14 percent, respectively. Packages consisting of loans only or of loans plus savings and earnings were the least common, with less than 5 percent of each group reporting such funding.

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[98] This category is assumed from the fact that no aid was reported from the three major support categories (grants and scholarships, loans, earnings, or savings).

Separate inspection of the distributions of financial aid packages for freshmen and sophomores and for juniors and seniors, in each former participation pattern group, reveals certain interesting transitions in the patterns of support for these groups.[99] Among those classified as last being freshmen or sophomores, typical participants were less likely than atypical participants and nonparticipants to rely on aid packages consisting only of family contributions or of personal savings and earnings, and more likely to rely on multi-source packages comprised of grants, loans, and earnings or savings. In contrast, no significant differences were found in the proportional packaging of financial support reported by those classified as last being juniors and seniors. The patterns of financial aid packaging for all three groups suggest a shift during the junior and senior year to an increased reliance on loans as part of the total package. For atypical participants and nonparticipants, this shift is characterized by a corresponding reduction in the numbers of students relying solely on family contributions or personal savings or earnings, and may reflect their increased sophistication regarding the sources of student aid available and the procedures for obtaining such aid.[100]

3. Amounts of Financial Aid Received

The average amounts of financial assistance received from each of the three major aid categories (grants or scholarships, loans, earnings or savings) by former UB participants and nonparticipants during their last year of PSE at different types (level-of-offering) of schools are shown in Figure 11 (see also Tables H.44, H.45, and H.46).[101] Within each type of school, typical participants generally receive a higher dollar amount of total aid than atypical participants who, in turn, receive more aid than nonparticipants. The differences in total aid between typical participants and nonparticipants is primarily attributable to the significantly higher average grant amounts received by the former group in all three school types; at vocational schools and four-year

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[99] For purposes of these analyses, freshmen and sophomores are defined as students with eight or fewer terms of PSE; juniors and seniors are defined as students with nine or more terms of PSE. Number of terms is based on a quarter-system, and summer term attendance is included.

[100] It is possible, of course, that the differential aid patterns were somehow instrumental in the fact that certain individuals were last classified as freshmen or sophomores (i.e., because of the aid package received, they were not able to continue).

[101] Results within the vocational/technical school type are somewhat attenuated due to small cell sizes, which led to some violations of the assumptions of the analytic model.

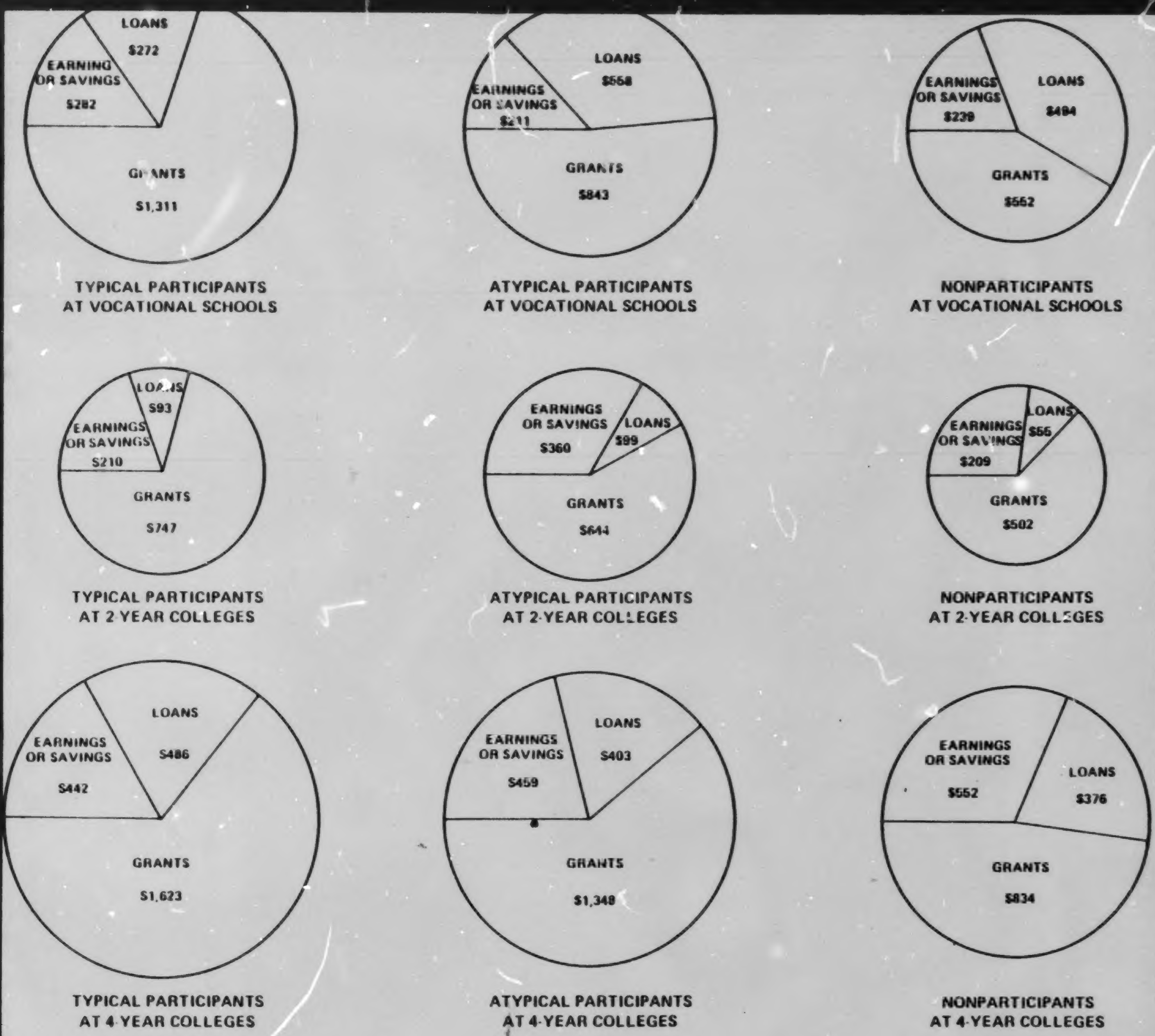

Figure 11. Amount of financial aid received as a function of Upward Bound participation pattern and institutional level-of-offering.

colleges, the average grant amount received by typical participants is about twice that received by nonparticipants.

F. Adequacy of Financial Aid

Former UB participants are more likely than nonparticipants to (1) receive financial aid from grants or scholarships, loans, and college-sponsored work programs, and (2) receive greater amounts of grant/scholarhip awards and of total aid; consequently, it is reasonable also to expect differences between these groups in the perceived adequacy of the financial aid packages received.[102] To provide more meaningful comparisons, separate analyses were conducted for two categories of institutional cost.[103] Greater detail regarding these analyses is provided in Tables H.47 through H.56.

Generally speaking, while differences in the perceived adequacy of financial aid received were observed for UB participants and nonparticipants, these differences were moderated by the cost of the institution last attended by these groups. In regard to the perceived adequacy of total aid package (combined aid from grants, scholarships, loans, and work opportunities), about 60 percent of the participant and nonparticipant groups who had last attended low-cost institutions reported that support was at least adequate or that no such assistance was needed. On the other hand, among those who last attended schools with higher per-student costs, significantly greater percentages of UB participants (over 75 percent) reported receiving adequate total aid packages than did nonparticipants (59 percent).

Considering the various types of support comprising the total aid package, the major significant difference observed between participants and nonparticipants was for grants and scholarships and, as with the total aid package, this difference was most pronounced for those who had last attended the higher per-student cost schools. The greater perceived adequacy of total aid package by UB participants may be due to the greater actual amount and perceived adequacy of grants received by this group.

Finally, with respect to family contributions, UB participants perceived such support as inadequate at significantly higher rates than nonparticipants, regardless of cost of institution last attended. More specifically, 55 percent of the typical participants attending higher-cost schools, as compared to 35 percent of the atypical participants and 29 percent of the nonparticipants, reported support from family contributions was inadequate; the corresponding percentages for individuals attending low-cost institutions are 47, 51, and 36. These findings are consistent with those reported in Section II of this chapter, which indicated higher percentages of UB participants indicating problems experienced with family or personal finances.

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[102] Respondents were asked to rate the adequacy of aid received from various sources on a five-point scale: 1 = no support needed, 2 = support very adequate, 3 = support adequate, 4 = support inadequate, 5 = support very inadequate or not received.

[103] For purposes of these analyses, institutional cost was dichotomized as institutions costing less than $1,000 per student and all others.

Some additional insight into the differences in perceived adequacy of student financial aid reported by UB participants and nonparticipants may be obtained by examining the composition of the "idealized" or desired total aid package reported by these individuals. Such an examination revealed no significant differences between program participants and nonparticipants; each group indicated that the most desirable aid package would consist of about 30 percent funding from loans or work-study programs (i.e., self-help sources) and about 70 percent from grants, scholarships, family contributions, or other obligation-free sources (see also Tables H.57). As can be seen from the results presented in the previous subsection (see Figure 11), the actual average aid package of UB participants more closely approximates this ideal than does that of nonparticipants, especially in four-year colleges and vocational schools. Viewed from this perspective, the greater perceived inadequacy of total aid package among nonparticipants attending higher-cost institutions is both logical and consistent.

IV. POSTSECONDARY PROGRESS, PERSISTENCE, AND PERFORMANCE

The results presented in Section II indicate that UB participants continue their formal education beyond high school at considerably higher rates than nonparticipants. The UB program objectives obviously extend beyond entry to "success" in PSE but, as previously noted, the program provides no direct intervention strategies once a former participant has entered PSE. Results in Section III suggest that UB participants attend different types of PSE institutions, that they have used available support services to a greater extent, and that they have been more successful in obtaining financial aid than nonparticipants. While none of these findings necessarily imply PSE "success" in the traditional sense, they do suggest program accomplishment in areas necessary for success.

This section examines measures of progress, persistence, and performance, once PSE entry has been gained. As noted earlier (Subsection I.B), these constructs are highly interrelated and reflect slightly different ways of assessing successful PSE behavior. To provide as clear and complete a picture of PSE success as possible, several measures of each of these constructs were considered. Analyses were restricted to the subset of individuals who had entered PSE and, in some cases, to those for whom usable transcript data were available.[104] Because of the established differential attendance patterns among the participation pattern groups and expected differences in outcomes for different school types, most comparisons were made within the level-of-offering category of school last attended.[105]

The results provided in this section have been organized to reflect the three broad PSE success outcomes (persistence, performance, and progress). Subsection A presents results for measures that are considered to be primarily related to persistence; subsection B presents results for measures of PSE performance; and subsection C presents results for the PSE progress variables. A brief synthesis of these analyses is provided in Subsection D.

A. PSE Persistence

Several measures of persistence were examined. The measures selected were those considered to be least confounded with progress or performance, and included: number of terms of attendance; two measures of educational discontinuity, stopout and dropout rates; and two measures of educational intensity, percentage of available summer terms attended and full-time attendance rates.

1. Number of Terms of PSE Attendance

This variable is considered primarily a measure of persistence, even though longer attendance implies some minimal performance and, thus, progress.

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[104] This latter restriction cannot be considered random. Refusal of access to transcript data or no record of an individual in a school at which he reported attendance suggests certain uncorrectable biases in the available data. Moreover, transcripts from some vocational/technical schools could not be adequately coded through the procedures developed (see Appendix E), again presenting a potential for uncorrectable bias.

[105] While additional control was thereby introduced, this additional partitioning produced some analytic problems associated with insufficient cell sizes. These problems were most pronounced within the subgroups last attending vocational/technical schools, in which case cell sizes were sufficiently small to guarantee violation of the within-stratum assumptions of the analytic model. Consequently, results pertaining to vocational/technical schools should be considered suspect.

Average number of terms attended[106] by the three UB participation pattern groups is presented in Figure 12 within institutional level-of-offering type (see also Table H.58). A relatively stable pattern of differences is evidenced across institutional types, with typical participants attending more terms, on the average, than either atypical participants or nonparticipants. These differences were not statistically significant, however, except among those attending vocational schools. Thus, there is no systematic evidence that UB participation pattern is related to the number of terms of PSE attendance when type of institution last attended is controlled. As shown earlier, however, former participants attend four-year institutions at significantly higher rates than nonparticipants. Since Figure 12 shows that those at four-year institutions attend for more terms, an overall (weighted combination over type of institution last attended) increase in length of PSE attendance accruing to former UB participants would be expected.

2. Educational Discontinuity

Discontinuing postsecondary education prior to program completion may imply a lack of persistence, as in the case of dropouts, or it may simply imply a state of withdrawal during which persistent behavior leads to no progress, as in the case of stopouts. The withdrawal (combined dropout/stopout) rates are considered first; withdrawal was defined to include any individual who was not currently enrolled in PSE for whatever reason and who had not graduated.[107] The results (see Table H.59) fail to show significant differences among participants and nonparticipants within type of institution last attended, and no systematic differences across institution type were indicated.[108] No more than one-third of those with some PSE were classified as withdrawals at the time of the second follow-up survey.

Dropouts were defined as those previously identified in the withdrawal group who reported that they did not intend to return to school. Dropout rates varied slightly across institutional type and among participation pattern groups within institution type, but differences were neither systematic nor

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[106] The scaling of terms attended represents terms under a quarter system.

[107] The exclusion of graduates was considered to provide a more meaningful measure, even though an implicit educational goal was thus imposed. Graduates could have been excluded from the analysis, but that would have restricted cell sizes even more severely.

[108] Actual analysis tested for differences in the proportion currently enrolled or graduated; however, as defined, the withdrawal rate is the compliment of this proportion and, thus, the statistical tests would be identical.

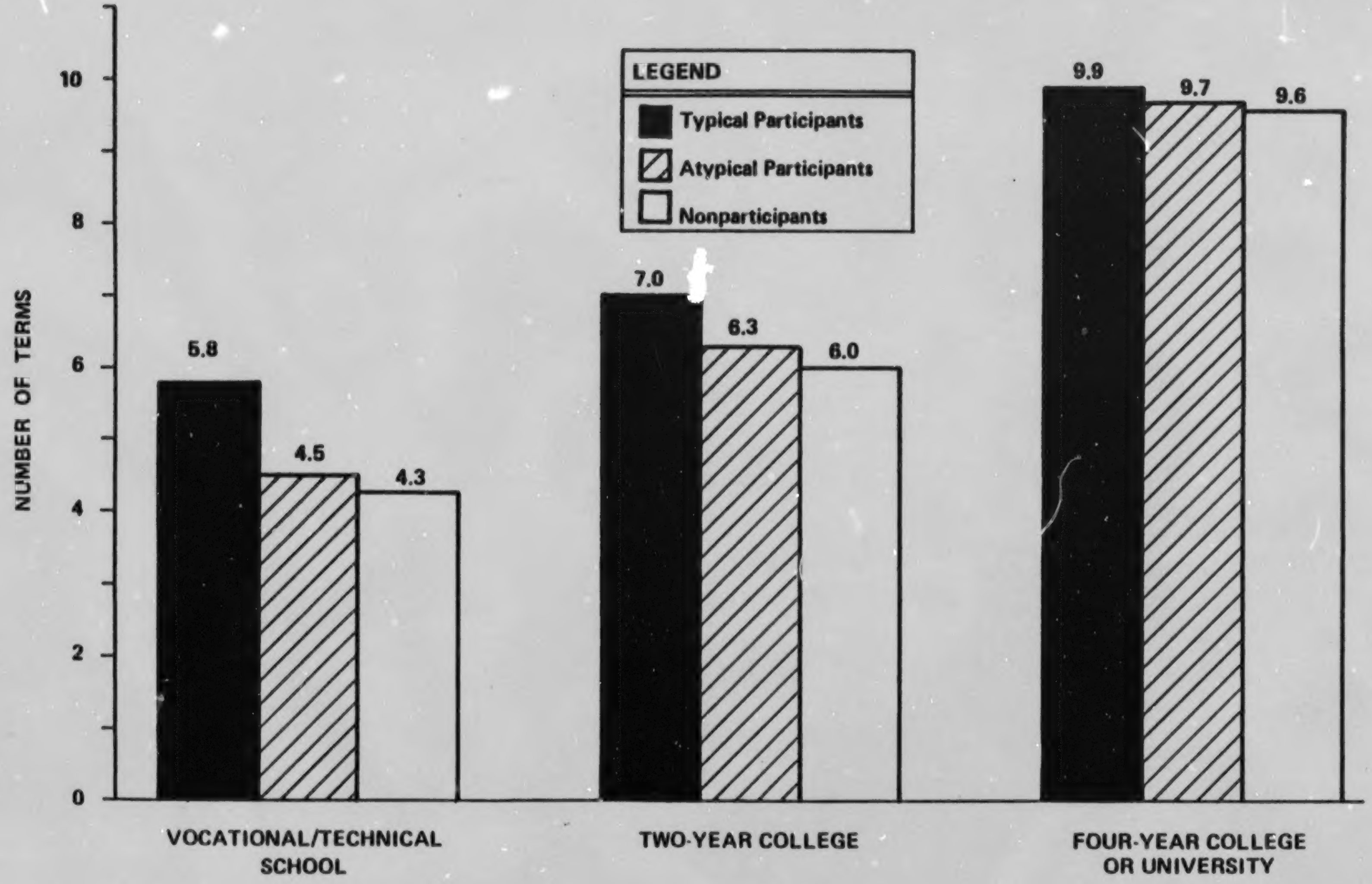

Figure 12. Number of terms of PSE attendance as a function of Upward Bound participation pattern and institutional level-of-offering.

statistically significant (see Table H.60).[109] Only 10 to 20 percent of the defined subgroups were classified as dropouts, indicating that from 80 to 90 percent of those who entered PSE were persisting in some way (were still in school, had persisted through graduation, or intended to return to school in the future).

3. Educational Intensity

A different way of assessing persistence is in terms of educational intensity. One measure of intensity of PSE exposure is the extent to which attendance is full-time. Examination of the rates of full-time attendance indicated no significant differences between UB participants and nonparticipants within institutional type (see Table H.61). Individuals who last attended four-year institutions showed a greater propensity for full-time-only attendance (almost 90 percent) than those attending two-year or vocational/technical schools. Individuals at two-year institutions reported the lowest level of full-time attendance, with less than two-thirds attending full-time; about three-fourths of those attending vocational/technical schools reported attending on a full-time basis.

Another indicator of PSE intensity is the percent of available summer terms attended. Figure 13 (see also Table H.62) shows the average value of this measure for the three participation pattern groups within the three types of institutions considered. The only significant difference was between typical UB participants and nonparticipants at four-year colleges. With the exception of those in vocational/technical schools, the patterns indicated in Figure 13 are similar to those of Figure 12, to which they contribute. Overall differences between institutional types are also indicated. Those in vocational/technical schools reported attending between 40 and 50 percent of the available summer terms, which is about double the average for those attending two-year institutions.

B. PSE Performance

Probably the most commonly considered aspect of PSE success is performance. Three measures of performance were examined: grade point average (GPA); rate of academic probation (poor performance); and rate of academic dismissal (unsatisfactory performance).

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[109] Actual analysis tested for differences in the proportion currently enrolled, graduated, or intending to return, which is the compliment of dropout rate.

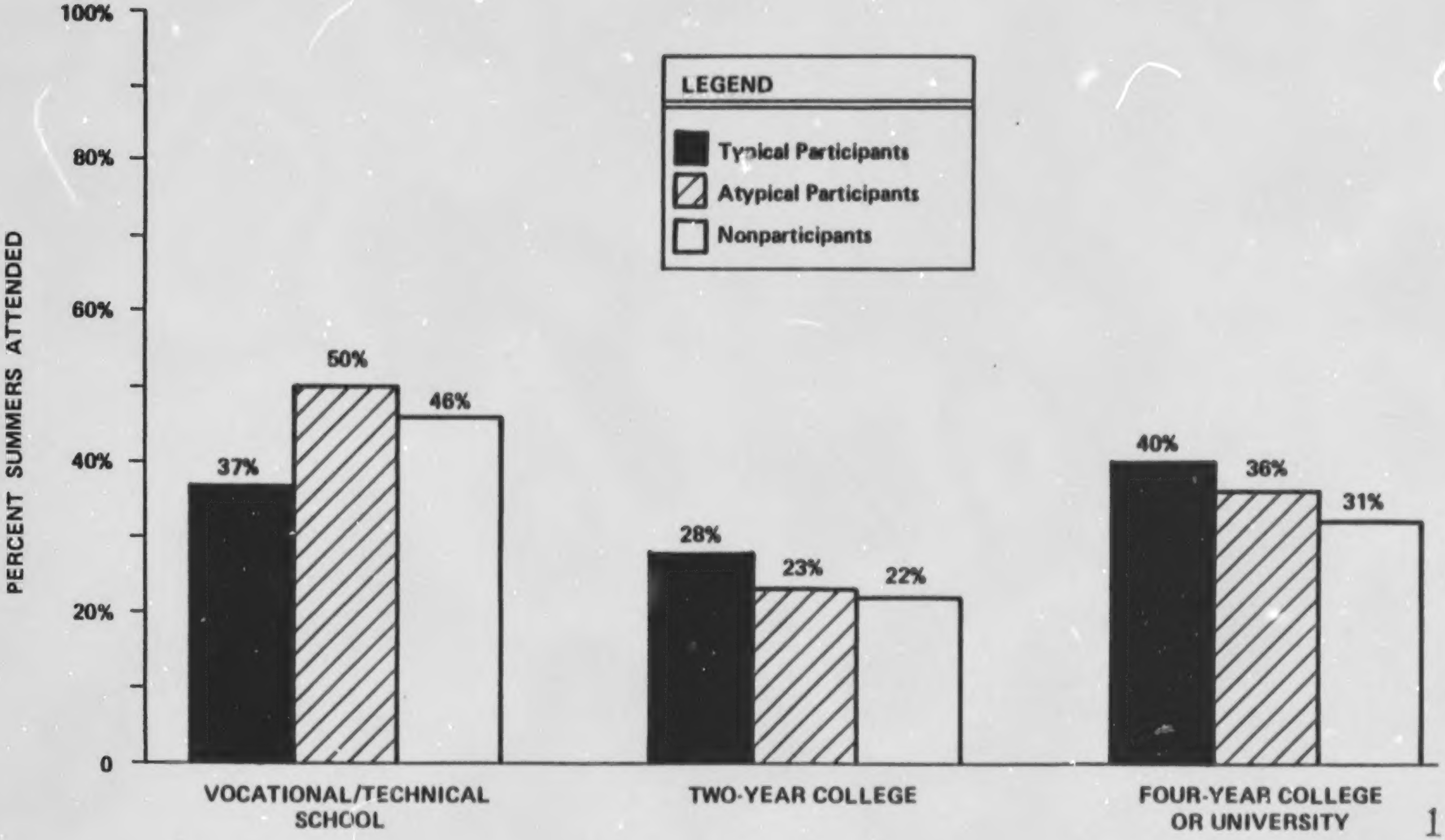

Figure 13. Percent of available summer terms attended as a function of Upward Bound participation pattern and level-of-offering of institution last attended.

1. Grade Point Average

Overall GPA could be computed only when useable transcript data were available. Unavailability of complete information regarding coursework attempted and grades received for transfer students (see Appendix E), restricted this measure to GPA at institution last attended. Although extremely small cell sizes vitiate meaningful interpretation within vocational/technical schools, the results of these analyses are provided in Figure 14 (see also Table H.63). Within each type of school there were no significant differences between the GPAs of typical and atypical participants. Similarly, no difference was indicated between typical participants and nonparticipants in two-year colleges. Within four-year colleges, however, typical participants exhibited significantly lower GPA's than nonparticipants. In general, these results suggest that a substantial proportion of the students in each group were in potential jeopardy of completing their program of study, since the average GPA's are about 2.00 (equivalent to a letter grade of C), which is the normal minimum GPA for graduation.

Because of the nature of the measure of GPA considered (restricted to courses taken at institution last attended), GPA was further examined within the subgroup of individuals who had not transferred (for whom GPA was based on the complete PSE record).[110] The same pattern of results was obtained for this restricted group as for the overall group (see Table H.64). In fact, GPA's for the group of non-transfer students were typically lower than those for the total group. This result is not surprising, since nontransferring individuals include those who performed so poorly at the institution that they were dismissed.

2. Academic Probation and Dismissal

Two additional measures of PSE performance were examined: rate of academic probation and rate of academic dismissal. These measures also could be computed only for those with useable transcript data. Overall differences in academic probation rates were observed among institutional types, with the lowest probation rates found among vocational/technical school students (typically less than 10 percent), followed by two-year college students (under 15 percent) and four-year college students (20-25 percent). No systematic differences in rates of academic probation were indicated among participants and

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[110] Unfortunately, within this restricted subgroup, results applicable to both vocational/technical schools and two-year colleges cannot be safely interpreted due to insufficient cell sizes.

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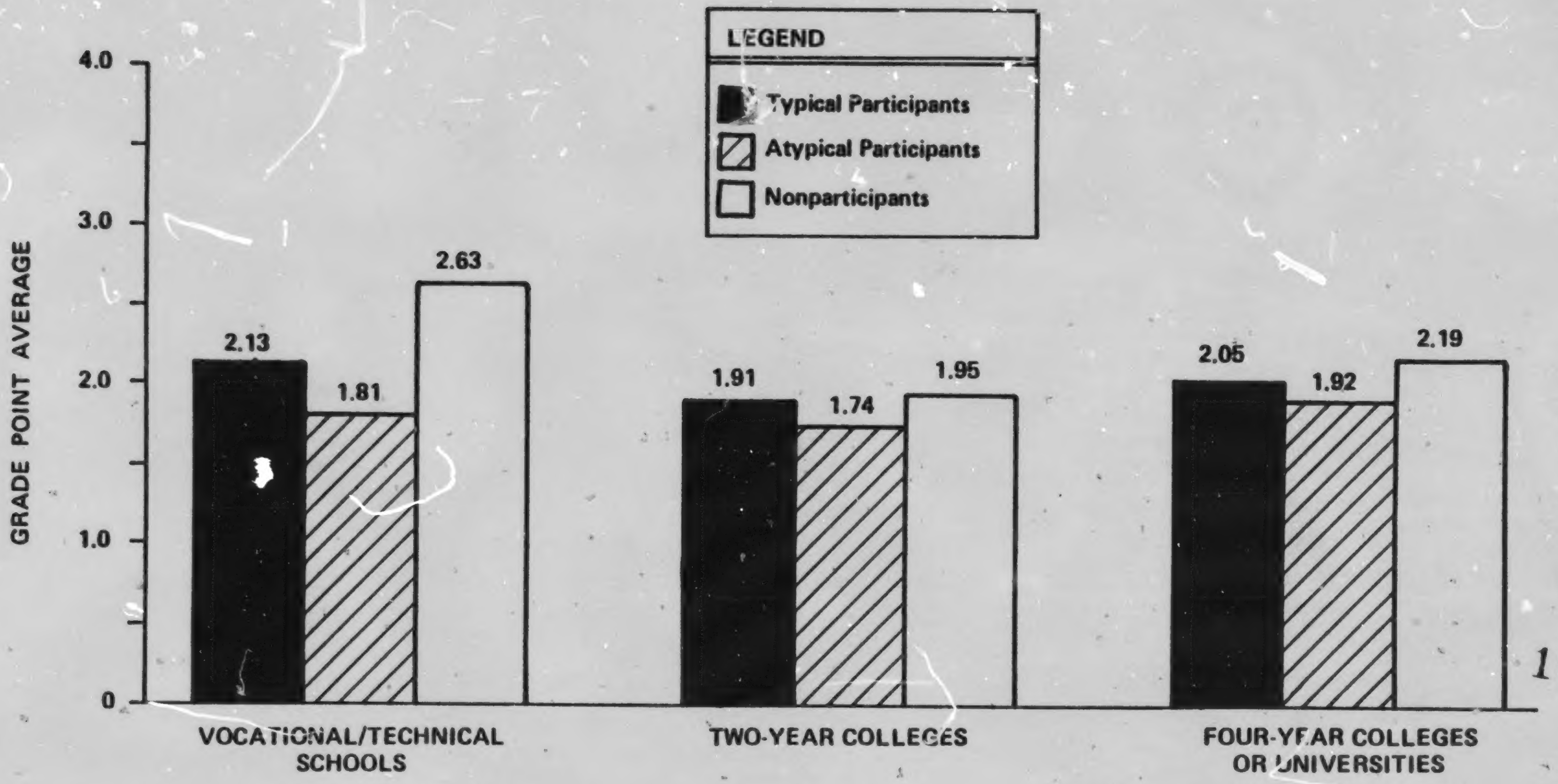

Figure 14. Grade point average at institution last attended as a function of Upward Bound participation pattern and level-of-offering of last attended institution.

nonparticipants, within any school type (see Table H.65).[111] Academic dismissal rates were generally less than 10 percent regardless of classification by participation pattern or by school last attended (see Table H.66).

C. PSE Progress

Progress is also an obvious aspect of PSE success. Although measures of progress necessarily reflect persistence, the variables considered in this subsection differ from those in subsection A in that they explicitly indicate progress through the educational system. Considered as measures of progress are: total earned credits; graduation; entry into graduate training; and progress relative to expressed educational goal.

1. Number of Credits Earned

One way of examining PSE progress is the number of credits earned in PSE, since it is this measure which determines an individual's class in school (e.g., freshman, sophomore). Figure 15 shows average earned credits for the three UB participation groups within each of three institutional types (see also Table H.67). As might be expected, those attending four-year colleges reported substantially more earned credits than those in either two-year colleges or vocational/technical schools. Although nonparticipants have earned slightly more credits, on the average, than participants within both vocational/technical schools and four-year colleges, the averages are statistically equivalent. Thus, these results provide no indication of differential success as a function of UB participation pattern, when type of institution is controlled. Here again, however, greater overall progress of participants is expected, since participants attend four-year institutions at much greater rates and since more credits are typically earned at four-year institutions.

To yield a somewhat different measure of progress (i.e., rate of progress), credits earned were scaled to provide a measure of earned credits relative to credits that would be expected under normal progression while enrolled (see Appendix E). Within institution type, the rate of progress among participants and nonparticipants did not differ significantly, but average rate of progress was considerably less than "standard" progression for all participation pattern groups. Rate of progress was different, however, as a function of institution

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[111] "Significant" differences were found among those last attending vocational/technical schools; however, this result is considered spurious, since small cell sizes for that subgroup guaranteed inappropriate standard error computation.

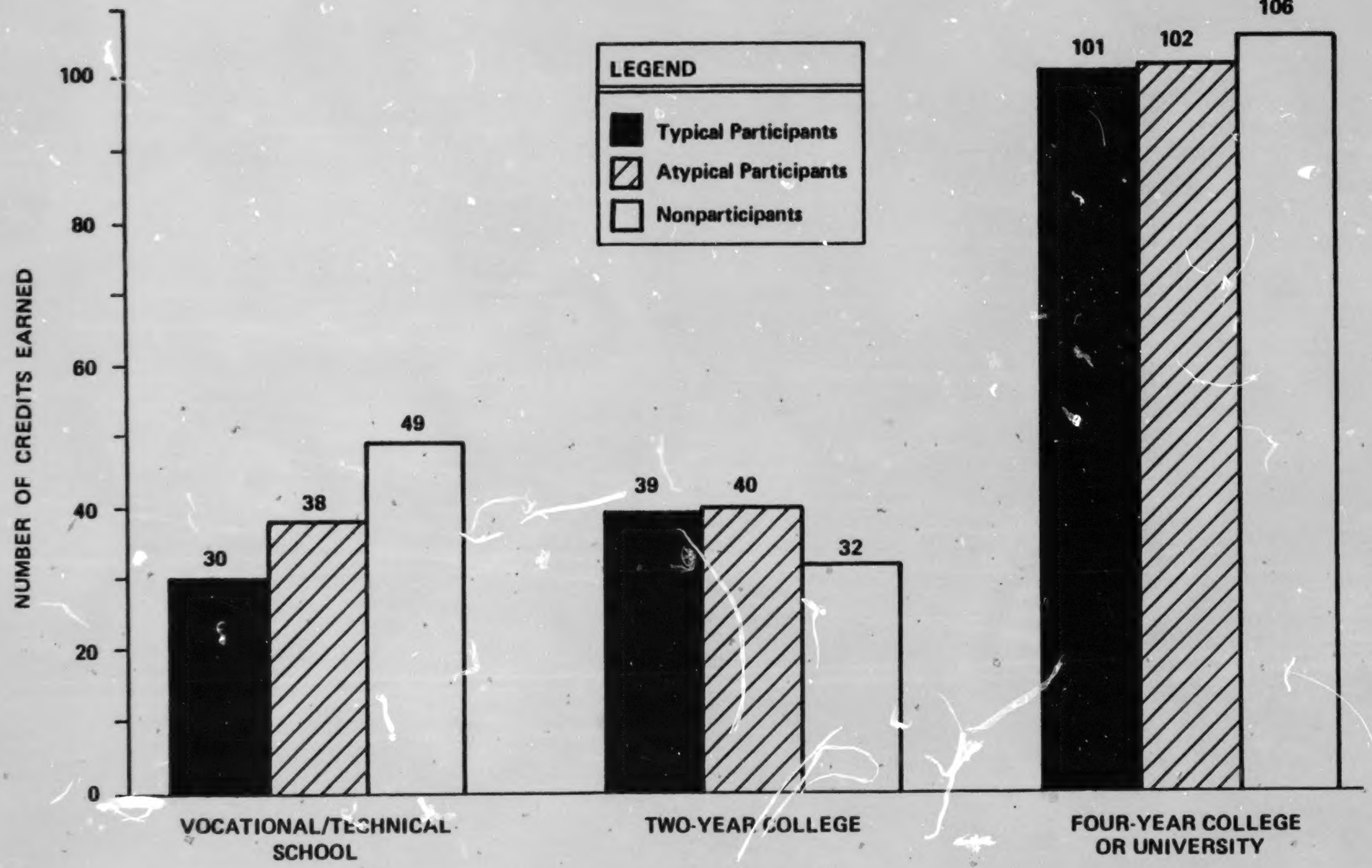

Figure 15. Number of earned credits as a function of Upward Bound participation pattern and institutional level-of-offering.

last attended. Those attending four-year institutions had progressed at a faster rate (about 60 percent of a normal pace) than those at two-year institutions or vocational/technical schools (about 30 percent of a normal pace). These results are consistent with those presented earlier regarding full-time -only attendance rates. Again the disproportionately greater attendance of UB participants at four-year institutions would suggest an overall greater rate of progress as compared to nonparticipants (see Table H.68).

2. Graduation

An obvious criterion of PSE success is eventual graduation, which signals the successful completion of a program of study. Considering all grade cohorts, no significant differences were found in graduation rates among the three participation pattern groups within any of the three types of institutions last attended; however, inter-institutional differences were indicated (see Table H.69). Over 40 percent of those last attending vocational/technical schools had graduated, compared to approximately 15 percent of those at four-year colleges, and less than 10 percent of those at two-year colleges.[112]

While graduation from vocational/technical schools and two-year institutions was possible for all grade cohorts under normal progression, graduation from a four-year institution is not, since only the twelfth-grade cohort could be expected to have completed a four-year program. Therefore, graduation rates were examined separately for the twelfth-grade cohort (see Table H.73). Although the graduation rate from four-year institutions of UB participants in the twelfth-grade cohort (over 30 percent) was about twice that of nonparticipants (17 percent), the difference was not statistically significant. Since the UB participants in the twelfth-grade cohort attended four-year institutions at about twice the rate of nonparticipants (Table H.72), and since they also entered PSE at greater rates (Figure 3), an estimate of overall four-year institution graduation rate among participants would be considerably higher than for the nonparticipants.[113]

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[112] The low rate of graduation at two-year schools may reflect the fact that those who completed two-year programs and transferred to four-year institutions are not represented in the results (since they are then classified as last attending a four-year school). Rates for those last attending vocational/technical schools may be similarly depressed.

[113] These analyses lend support to the suspicion that previously-reported graduation rates from vocational/technical schools and two-year institutions were depressed, since less than 15 percent of those in the twelfth-grade cohort last attending such schools reported graduation.

3. Graduate School Entry

Educational progress does not necessarily stop with the completion of a four-year degree, and many professional and nonprofessional occupations now require additional graduate study. Moreover, as reported earlier (Figure 1) substantial proportions of UB participants aspire to graduate study. Examinations of graduate school entry rates were restricted to those for whom such progress could be reasonably expected (i.e., those in the twelfth grade cohort who had completed a four-year program). Resulting cell sizes were very small, and no differences were suggested.[114] Roughly 10 percent of each participation pattern group reported graduate school entry (Table H.70).

4. Progress toward Educational Goal

Results reported earlier (Subsection II.B.3) for the total sample considered a progress measure reflecting percent of progress toward educational goal (see Appendix E). This goal-related measure of progress was reexamined for those individuals that entered PSE. Results indicated no significant differences among the former participant and nonparticipant groups (Table H.71). In general, those last enrolled in two-year and four-year academic programs had persisted over half of the way toward their goal, while those last in vocational/technical programs had progressed only about one-third of the way toward their goal.

Previous results for the total group (including those who did not enter PSE) indicated an advantage for the former participants on this measure of progress, but results for the same variable within the PSE-entering subgroup indicated no difference among the three participation pattern groups. Taken together, these two results imply that the overall results reflect the differences in PSE entry rate among the UB participants; that is, the reason that participants progress further toward their educational goal is because they enter PSE at higher rates.

D. Implications

Results presented in this section have been relatively consistent in failing to demonstrate systematic differences in PSE success among UB participants and nonparticipants, once they have entered PSE and once the particular institutional setting has been established. It should be recognized, however, that the comparability of the nonparticipant group is, in some respects, questionable. Even though the two groups were statistically adjusted on various background factors (such as poverty status, academic risk status, minority status, etc.), it is not possible to adjust for the fact that the nonparticipants represent a self-selected set of survivors who have progressed/persisted into postsecondary education without benefit of the assistance provided to UB participants. Moreover, given the indicated slower than normal educational pace for all the groups, there is no reason to expect that the estimates of educational progress, persistence, and performance, measured at this time, reflect final values of these measures for either UB participants or nonparticipants.

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[114] Cell sizes were so small as to prohibit appropriate computation of standard errors, thus the differences, while small, could not be appropriately tested for statistical significance.

From a broader perspective, there is an indication that former UB participants, on the whole, experience greater overall postsecondary success than their nonparticipating peers. Because UB participants enter PSE at considerably higher rates than nonparticipants, they tend to persist and progress further toward their educational goals (even though their goals are higher). Further, because UB participants attend four-year institutions at considerably higher rates than nonparticipants and because persistence/progress measures are typically greater for those who have attended such institutions, they progress and persist further than nonparticipants, even within the PSE-entering subgroup.

Chapter 4

Modeling Postsecondary Outcomes

I. INTRODUCTION

Although the analyses reported in Chapter 3 addressed all of the questions posed for the study, other questions have been raised in the process. Specifically, there is a need for a comprehensive approach to analysis in which student outcomes are examined in relation to the student characteristics (e.g., age, sex, ethnicity, poverty status, academic risk status), and grade level or contextual influences (e.g., use of PSE services, financial aid, institutional setting), as well as to the pattern of UB participation. Results presented in Chapter 3 suggested that differences in PSE outcomes among UB participants and nonparticipants may be explained through intervening factors of the PSE experience; however, the statistical procedures used did not permit simultaneous adjustment for a large number of intervening factors.

This chapter represents an attempt to provide such a comprehensive examination, through the formulation of a model of PSE outcomes and the examination of the relationships among the elements of that model. This modeling approach, embodied in recently developed techniques collectively known as analysis of covariance structures, provides a better means to exploit the multivariate nature of the data and to examine the complex structure of relationships among key variables. Nonetheless, this technique requires considerably more assumptions than the approach taken in Chapter 3 and must be considered exploratory. Further, in conducting these analyses, weighting assumptions were made[115] that restrict the generalizability of the results. While the developed model is convenient in explaining the data, there are probably other models that could fit the data as well or better.[116] Due to the many assumptions made, considerable caution should be exercised in interpreting these results.

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[115] The approach eliminated technical problems imposed by the markedly larger population represented by the substantially fewer nonparticipant sample members. The approach used was a form of balancing and was based on a desire to create a quasiexperimental situation in which outcomes could be modeled for two more-or-less equivalently sized groups with analogous distributions of background factors.

[116] There are some indications in the solutions suggesting a strong likelihood of model misspecification.

The remainder of this introductory section provides a brief overview of the modeling approach. Results are presented in subsequent sections of the chapter. Greater detail regarding preliminary examinations leading to a specification of the model adopted and resulting solutions is provided in Appendix I. Appendix I also provides considerable detail regarding the many constraints and limitations associated with these analyses.

A. Analytic Considerations

The structural equation approach used is similar to path analysis[117] but actually represents a more general procedure developed for analysis of covariance structures.[118] This procedure is not a method for discovering causes; rather, the approach investigates potential causation in a predictive or explanatory sense. The application is in testing a model of directional relationships, formulated on the basis of prior knowledge and/or theoretical considerations.[119] Analytic solutions indicate whether the model examined is plausible (not necessarily the most plausible) and, the nature of the relationships within the assumed model.

Structural equation approaches investigate both the direct and indirect effects of antecedent variables on outcomes of interest, in contrast to standard regression analysis, which assesses only the simultaneous direct unique relationships of variables to an outcome. The different types of effects are determined through a decomposition of the overall relationship of one variable to another into (a) the indirect effect, the part that operates only through other intervening variables in the model, and (b) the direct effect, the residual portion of the relationship that is unique (i.e., does not operate through intervening variables). Thus, within the adopted model, it is assumed that some of the overall relationship of one variable to another is due to relationships (links) that exist with other intervening variables and a residual portion of the relationship that cannot be explained through these other variables.

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[117] See Kerlinger, F. N. and E. J. Pedhazur, Multiple Regression in Behavioral Research. New York: Holt, Rinehart & Winston, 1973, or Duncan, O. D., Introduction to Structural Equation Models. New York: Academic Press, 1975.

[118] Jöreskog, K. G. A General Method for Analysis of Covariance Structures, Biometrika, 57(2), 1970, p. 239-251.

[119] Thus, structural equation models (and solutions) involving the same constructs can vary with the tenets of the particular theoretical framework adopted. Moreover, the inclusion or exclusion of particular variables from the model can change solutions dramatically.

Structural models can be expressed by means of directional paths interrelating the set of variables considered, and solutions typically yield coefficients associated with the paths, which may be interpreted in a similar manner to regression coefficients The coefficient associated with the path that leads directly from a variable of interest to the criterion variable considered represents the direct effect portion of the relationship, while the sum of the products of coefficients associated with paths that lead through intervening variables may be taken as the indirect effect.

B. Modeling Considerations

The model examined through structural equation approaches should be based in theory, since the posited model is thereafter assumed to be the only representation of the structural interrelationships. All results are, thus, conditional on the assumed model. Several models were considered, in light of their theoretical soundness, the availability and scale properties of key variables, and potential technical problems. The nature of the model finally adopted is depicted in Figure 16.

The model posits specific relationships among the elements, indicated by arrows. Two classes of variables are taken as starting points for prediction: UB participation pattern and background characteristics. Relationships are allowed to exist between these variable classes (and among the variables within each class), but no direction is assumed for these relationships. Both of these basic predictor variable classes are considered to predict the next class of variables in the model, PSE context factors. The next directional links in the model are to the class of variables regarding use of support services. Prediction of this class of variables is assumed from UB participation pattern, background characteristics, and from PSE context factors. Thus, indirect effects may exist through PSE context factors (e.g., the relationship between UB participation pattern and use of support services may be partially explained through the relational link to PSE context factors and the subsequent link to use of services). The class of financial aid variables is modeled as related to all previously considered factors, and PSE success outcomes are assumed to be related to all other elements in the model.

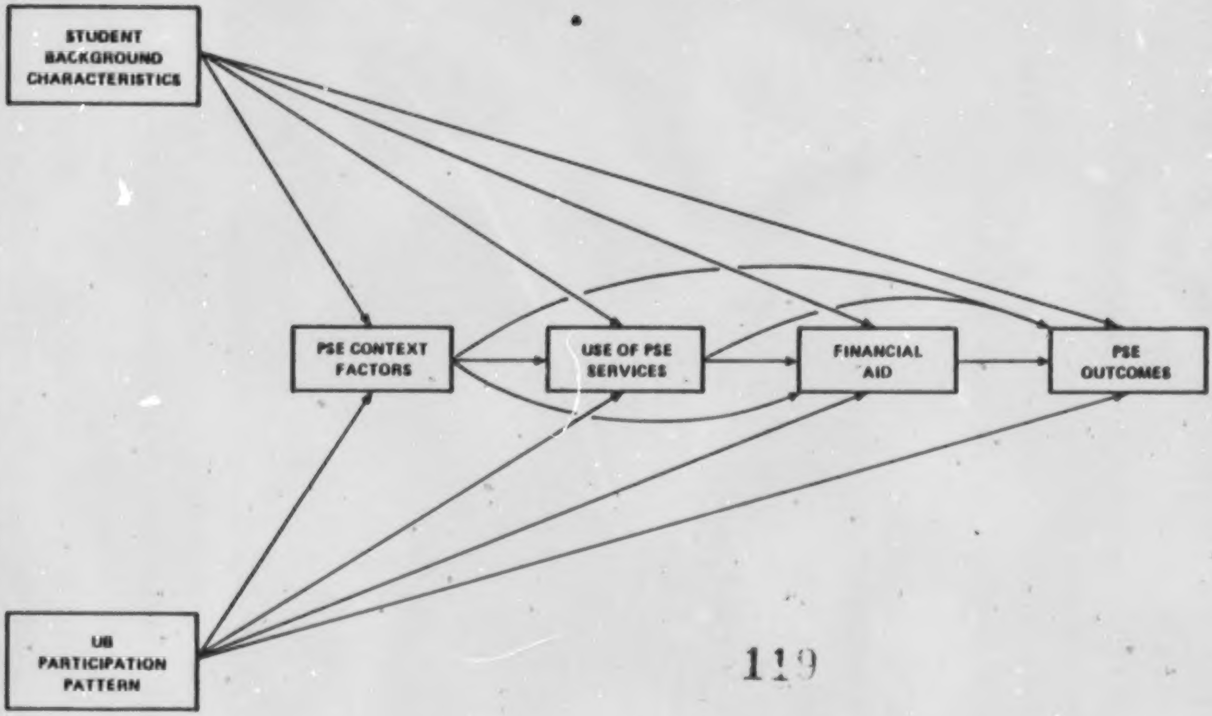
STUDENT BACKGROUND CHARACTERISTICS
PSE CONTEXT FACTORS
USE OF PSE SERVICES
FINANCIAL AID
PSE OUTCOMES
UB PARTICIPATION PATTERN

Figure 16. General form of the adopted theoretical model of PSE outcomes.

Even within the simplified conceptual model presented in Figure 16, there are 11 potential direct effects and considerably greater potential for indirect effects. For the actual variables that were considered (see following subsection), the number of direct and indirect effects is greatly increased. Further, since each variable set indicated in Figure 16 represents more than one variable, it was also necessary to model the relationships among variables within each set.[120] Thus, the model under consideration actually represents a very complex structure of relationships.

C. Other Methodological Considerations

Each of the classes of variables shown in Figure 16 was represented in the full model by one or more variables. Some variables are categorical in nature and were coded as (0,1) variables to be more amenable to relational analysis,[121] yielding a base group (coded 0) and a predictor group (coded 1). Resulting coefficients reflect the effect associated with the predictor group relative to the base group (e.g., the effect associated with being female rather than male).

Background characteristic variables were: (1) sex, (2) poverty status, (3) academic risk status, (4) grade cohort, and (5) racial/ethnic classification (Black, white, or other). The first three variables represent dichotomies, and base groups established for these variables were males, nonpoverty, and non-academic-risk. The remaining variables represent three-valued categories. Base groups for these variables were members of the eleventh-grade cohort and whites, respectively.

Five PSE context factors were considered: (1) UB host status, (2) SSDS host status, (3) institutional size, (4) institutional level-of-offering, and

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[120] Since directionality within a set typically was neither theoretically nor logically indicated, these relationships within sets were modeled as nondirectional, allowing the necessary existence of the relationships but introducing additional links through which indirect effects could operate. The operation of indirect effects through such nondirectional links is extremely difficult to interpret.

[121] Although assumptions are violated in using such variables, the procedure is commonly used and generally acceptable. Dichotomous variables provide a simple (0, 1) coding, but some categorical variables represent three classes and must be dealt with differently. The approach used in this case was dummy coding, which creates two related dichotomies, in which case the group coded 0 in both dichotomies is the base group (see Appendix I).

(5) institutional selectivity. The first two variables represent dichotomies in which non-host institutions were the base group; the remaining three variables were considered to represent scaled values.[122] Three support service use variables were considered, representing extent of using services within the three general support areas of tutoring, counseling, and remedial services. These data were treated as scale data.[123]

Four measures of financial aid were considered: receipt of grants or scholarships, (2) receipt of loans, (3) use of earnings or savings, and (4) scaled amount of grants/scholarships received. The first three variables represent dichotomies, with nonreceipt representing the base group. The final measure represents a five-valued scaling of total amount of grant/scholarship funds received, as adjusted by the cost of the institution last attended.[124] Three PSE success outcomes were considered: (1) a persistence measure, number of terms of attending PSE, (2) a performance measure, overall GPA at institution last attended, and (3) a progress measure, total termwise credits earned.[125] These variables represent interval or ratio scales.

The specific approach used in solving the posited structural model was one developed for analysis of linear structural relationships.[126] This approach is particularly applicable to the present problem. First, the general procedure allows for the posited nondirectional relationships within certain classes of intervening variables, which cannot be accomodated by many approaches to such a problem. Second, the procedure allows investigation of differential variable reliability (which is suggested for the data used), another feature that cannot be accomodated by simpler regression approaches.

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[122] It should be recognized that, while the constructs underlying selectivity and size may be represented on continuous interval scales, the actual variables used are transformations of the scales that preserve only the order.

[123] This scale also is considered to have only ordinal properties.

[124] Actually, the adjustment involved a five-valued categorization of institutional costs, such that this scale also is considered to have to have only ordinal properties. Unlike other variable classes considered, explicit directionality was assumed among these variables. The directionality assumed was similar to a model developed by OED staff.

[125] This represented a rescaling of total credits earned by 15 (the number of credits needed per term to progress normally in student class), which still represents a ratio scale variable.

[126] Jöreskog, K. G. & Sörbom, D. LISREL: Analysis of Linear Structural Relationships by the Method of Maximum Likelihood, User's Guide (Version IV, Release 2). Chicago, Ill.: National Educational Resources, Inc., November 1978.

II. MODEL SOLUTIONS

The solution indicated a reasonable fit between the model and the data for the case considered (see Appendix I).[127] Modeling results are presented separately for each of the PSE outcome areas shown in Figure 16. Solutions for types of schools attended are presented in Subsection A. Subsection B presents structural relationships of student background characteristics, Upward Bound participation pattern, and characteristics of schools attended to use of counseling, tutoring, and remedial services. Subsection C provides the solutions for predicting financial aid elements from these variables. Subsection D presents the solutions for PSE progress, performance, and persistence.

Table 1 (referenced in subsequent subsections) provides the final solution for the model. In general, Table 1 indicates the coefficients for the paths from the variables listed by row to the variables listed by column. Nonsignificant coefficients are indicated by a zero or by an asterisk (*) in the table. For example, the coefficient from typical UB participation pattern to UB host status of institution last attended is .202; the analogous coefficient associated with atypical UB participation pattern is .020, which does not differ significantly from zero.

For UB host status of institution, and other dichotomous variables (SSDS host status, grant receipt, loan receipt, and work receipt), the coefficients can be interpreted as an increase (or decrease, if the sign is negative) over that of the base group (see previous section) in the probability of achieving the state indicated. Thus, in the example under consideration, typical UB participation pattern is related to an expected increase of 20 percentage points, over the nonparticipation pattern rate, in the likelihood of attending a UB host institution.

A. School Type Attended

As indicated in Table 1, typical UB participation is significantly related to differential attendance for all school classifications considered, except

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[127] A very large number of free parameters would be necessary to specify the full model investigated, and the estimated costs of simultaneous estimation of all such parameters was extremely high. For this reason, preliminary regression approaches (see Appendix I) were employed to determine nonsignificant relationships. Parameters associated with nonsignificant relationships were fixed to zero, thus reducing the number of free model parameters to be estimated.

Table 1

General Solution for the Structural Model Examined

Predictor Variables	Criterion Variables														
	Institutional Level-of-Offering	Institutional Size	Institutional Selectivity	Institutional UB Host Status	Institutional SSDS Host Status	Extent of Tutoring Use	Extent of Remedial Services Use	Extent of Counseling Use	Receipt of Grant	Adjusted Grant Amount	Receipt of Loan	Use of Savings or Earnings	Number of Terms Attending PSE	Termwise Credits Earned	Grade Point Average
Typical UB Participants[a]	.343	0	.129	.202	.052	.206	.122	.141	0	0	.136	0	0	-.679	-.200
Atypical UB Participants[a]	.172	0	.079*	.020*	-.029*	.188	.106*	.156	0	0	.093	0	0	-.414	-.269
Tenth-Grade Cohort[a]	0	0	0	0	0	0	0	0	0	.261	-.042*	0	-2.529	-1.900	0
Twelfth-Grade Cohort[a]	0	0	0	0	0	0	0	0	0	-.138	.050	0	1.200	.824	0
Female[a]	-.129	0	-.146	0	0	0	0	0	0	0	0	-.171	0	0	.117
Academic Risk[a]	-.128	0	-.128	0	.050	0	.231	0	.113	.170	0	-.080	-1.485	-2.042	-.410
Black[a]	0	.030*	-.293	0	0	.461	.485	.305	.109	.155*	0	-.178	1.949	.847	-.203
Other Nonwhite[a]	0	.492	-.011*	0	0	.306	.269	.138*	.090	.521	0	-.083*	1.006	-.220*	-.239
Poverty Status[a]	0	-.285	-.090	.113	.080	0	0	0	.139	.484	0	0	-.586	-.523	-.121
Institutional Level-of-offering[b]	--	--	--	--	--	0	0	0	.061	0	.042	.092	2.138	2.502	0
Institutional Size[b]	--	--	--	--	--	0	0	-.072	-.060	0	-.068	0	0	-.334	-.100
Institutional Selectivity[b]	--	--	--	--	--	0	-.127	0	.058	.233	.116	0	0	.276	0
Institutional UB Host Status[c]	--	--	--	--	--	.245	0	0	.070	.398	0	-.107	0	.583	.130
Institutional SSDS Host Status[c]	--	--	--	--	--	-.167	-.180	0	-.056	0	0	.079	-.995	-.605	0
Extent of Tutoring Use[b]	--	--	--	--	--	--	--	--	0	0	0	0	.196	0	-.039
Extent of Remedial Services Use[b]	--	--	--	--	--	--	--	--	0	0	0	0	0	0	-.106
Extent of Counseling Use[b]	--	--	--	--	--	--	--	--	0	0	.047	.060	0	-.311	0
Adjusted Grant Amount[b] [d]	--	--	--	--	--	--	--	--	--	--	0	-.033	.481	.682	.052
Receipt of Loan[c]	--	--	--	--	--	--	--	--	--	--	--	.199	0	.412	.082
Use of Work, Savings, or Earnings[c]	--	--	--	--	--	--	--	--	--	--	--	--	.944	.794	.177

NOTE: An asterisk (*) is used to indicate lack of statistical significance for one of a pair of related dummy variable contrasts; otherwise, zero (0) indicates statistical nonsignificance.

[a] These variables represent dummy variable codings of categorical variables; the base group is implied.

[b] These variables are treated as continuous.

[c] These variables are dichotomous.

[d] Adjusted to a five-valued scaling on the basis of amount of grant/scholarship received and institutional cost.

institutional size. Specifically, typical UB participants are more likely to attend institutions with higher levels of offering, more selective institutions, and institutions hosting UB and SSDS programs. Atypical UB participation, on the other hand, is significantly related only to institutional level of offering. These results are consistent with the findings reported in Chapter 3.

Direct effects of student background characteristics to PSE attendance pattern are indicated for each of the institutional categorizations considered. Females are more likely to attend institutions with lower levels of offering and less likely to attend more selective institutions. This relationship can be partially explained by the large number of female sample members who reported last attending schools providing training in health-related areas (e.g., schools of nursing). A similar pattern of expected attendance is observed for academic risks (i.e., lowered likelihood of attending either institutions with higher levels of offering or selective institutions). These results for academic risks may reflect differences in admissions requirements or practices. Academic risks also show an increased likelihood of attending SSDS host institutions, which may reflect either their awareness of increased service availability or more sensitive entrance requirements at such schools.

Ethnicity was significantly related to differential attendance in regards to institutional size and selectivity. For institutional size, the coefficients suggest a propensity of racial minorities other than Black to attend larger institutions (the coefficient for Black students is not statistically significant). This finding may be artifactual, due to the specific sample under consideration. Most of the non-Black minority students (principally Hispanics) were sampled within large metropolitan areas in the Southwest, far West, and Northeast, where larger schools more frequently exist. The pattern of significance of the coefficients for institutional selectivity is reversed, with Blacks showing a significant propensity to attend lower selectivity schools, while non-Black minority status is not significantly related to school selectivity. Given the more liberal admission policy characteristics of predominantly Black institutions (as related to the specific index used to determine institutional selectivity--i.e., student body average on standardized tests) and the relatively high rate of attending institutions with predominantly or traditionally Black student bodies among the individuals in this sample (which could again be a function of the particular way in which the sample was drawn and proximity of institution), this result may also be sample specific.

Poverty status is the background characteristic most related to type of institution attended. While poverty status is not significantly related to institutional level-of-offering, it is related to size, selectivity, and UB or SSDS host status. Poverty-level individuals are less likely to attend large schools or more selective schools, and are more likely to attend UB and SSDS host institutions. Some of these effects may be associated with different institutional costs (a PSE characteristic not considered directly in these analyses) through interrelationships of that variable with the institutional variables under consideration.

B. Use of Services

Typical UB participants use counseling, tutoring, and remedial services to a greater extent than the base group (nonparticipants), as indicated by the coefficients associated with typical participation pattern in Table 1. Atypical participants also use these services to a greater extent than nonparticipants; however, their greater use of remedial services is not statistically significant. These results are generally consistent with the findings reported in Chapter 3.

Grade cohort, sex, and poverty status show no significant relationships to extent of service use. Academic risk, on the other hand, is positively related to use of remedial services (as might be expected), but no significant direct relationship of academic risk to use of tutoring or counseling was indicated. Both Blacks and other ethnic minorities show greater use of the services than the base group (whites). Given the statistical control for other background factors, the effects on service use by student ethnicity may be due to some unmeasured aspects of other constructs (i.e., poverty status and academic risk status) that is reflected in student ethnicity measures.

Of the five institutional characteristics considered, only institutional level-of-offering failed to show a direct relationship to service use. Students at larger institutions showed less use of counseling services than those at smaller institutions, which may be a function of the greater impersonalization on large campuses. Individuals at more selective institutions used remedial services to a smaller extent than those at less selective institutions, which may reflect different admissions standards. Students at UB host institutions used tutoring services more frequently than those at non-host institutions; however, students at SSDS host institutions used both tutoring and remedial services to a smaller extent than those at the non-host institutions. This latter result is not consistent with the findings provided in Chapter 3; however, analyses reported in Chapter 3 did not control statistically for other institutional characteristics (i.e., level-of-offering, size, selectivity, and Upward Bound host status).

In considering service use, the indirect effects of UB participation pattern to use of the three services through differential institutional type attendance patterns may be examined. The overall effect of typical UB participation pattern on tutoring use reflects an increase over the direct effect through UB host status, since (1) typical participants attend UB host institutions at greater rates, and (2) students at UB institutions use tutoring services to a greater extent. The increase due to the indirect effect of typical UB participation pattern on tutoring use can be estimated by multiplying the two coefficients under consideration (i.e., .202 times .245, or approximately .05--see Table 1 or Figure 17). In a similar manner, the overall effect of typical UB participation on tutoring reflects a decrease through the finding that typical UB participants are more likely to attend SSDS host institutions and the finding that individuals attending SSDS host schools report less use of tutoring services than those at non-host institutions. The overall indirect effect of UB participation and tutoring use, considering both of these indirect paths, is approximately a net gain of .04.[128]

Similarly, there is an indirect effect of typical UB participation on the use of remedial services through the intervening variables of institutional selectivity and SSDS host status, which results in a net decrease of about .03. The only institutional characteristic related to a change in counseling use is institutional size, and former UB participation pattern is not related to institutional size. Thus, there are no indirect relationships in the extent of the use of counseling services. Relative to the direct effects, the indirect effects on service usage through the types of institutions attended are quite small.[129]

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[128] For atypical participants, no increase in tutoring use would be obtained since the relationship between atypical participation and attendance at UB or SSDS host institutions is not significantly different from zero.

[129] Recall (Section I) that additional indirect effects exist through the non-directional links among the institutional characteristics variables. While these relationships were allowed in the model, they are not reflected in the values provided in Table 1. The relatively small direct relationships between institutional types and service use would suggest, however, that additional indirect relationships would also be relatively small.

C. Financial Aid

Four measures of financial aid were used in the model (see Section I). Analytically, these variables were considered somewhat differently. The grant/scholarship receipt variable was considered separately.[130] The model solution for Receipt of Grant/Scholarship funds is provided in Figure 17. For clarity of presentation, some of the relationships are not shown;[131] however, the omitted coefficients can be determined by reference to Table 1. The relationships between typical and atypical UB participation pattern, school characteristics, and service usage (previously discussed) are also shown in Figure 17.

As shown in Figure 17, there is no direct effect of either typical or atypical UB participation pattern on receipt of grant or scholarship. In fact, the only variables that are shown to be related to grant or scholarship receipt directly are those within the institutional characteristics set. Since UB participation pattern is related to type of institution last attended, there are obvious indirect relationships between UB participation pattern and grant/scholarship receipt. The total indirect effect of typical Upward Bound participation pattern on receipt of grant/scholarship, as computed from the coefficients, is approximately .04, which can be interpreted as an expected increase of four percentage points in the probability of receiving some form of grant or scholarship as a result of typical UB participation. Since atypical UB participation is related to fewer of the institutional characteristics under consideration, the associated indirect effect is considerably less (.01). Thus, while not directly related to receipt of grant or scholarship, typical UB participation is associated with an overall increased likelihood of receiving such aid by indirect effects through differential PSE attendance patterns.

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[130] Since the rescaled value of amount of grants/scholarship funds received was considered a more meaningful variable for subsequent analyses, it was used, along with receipt of loans and use of earnings or savings, in subsequent modeling of the financial aid variable complex and of postsecondary performance, progress, and persistence.

[131] Specifically, the coefficients involving student background and temporal factors are not shown in the figure. Similarly, since neither typical nor atypical UB participation pattern was related to size of institution last attended, implying that no indirect relationships of UB participation pattern could operate through that variable, subsequent paths for institutional size are not shown.

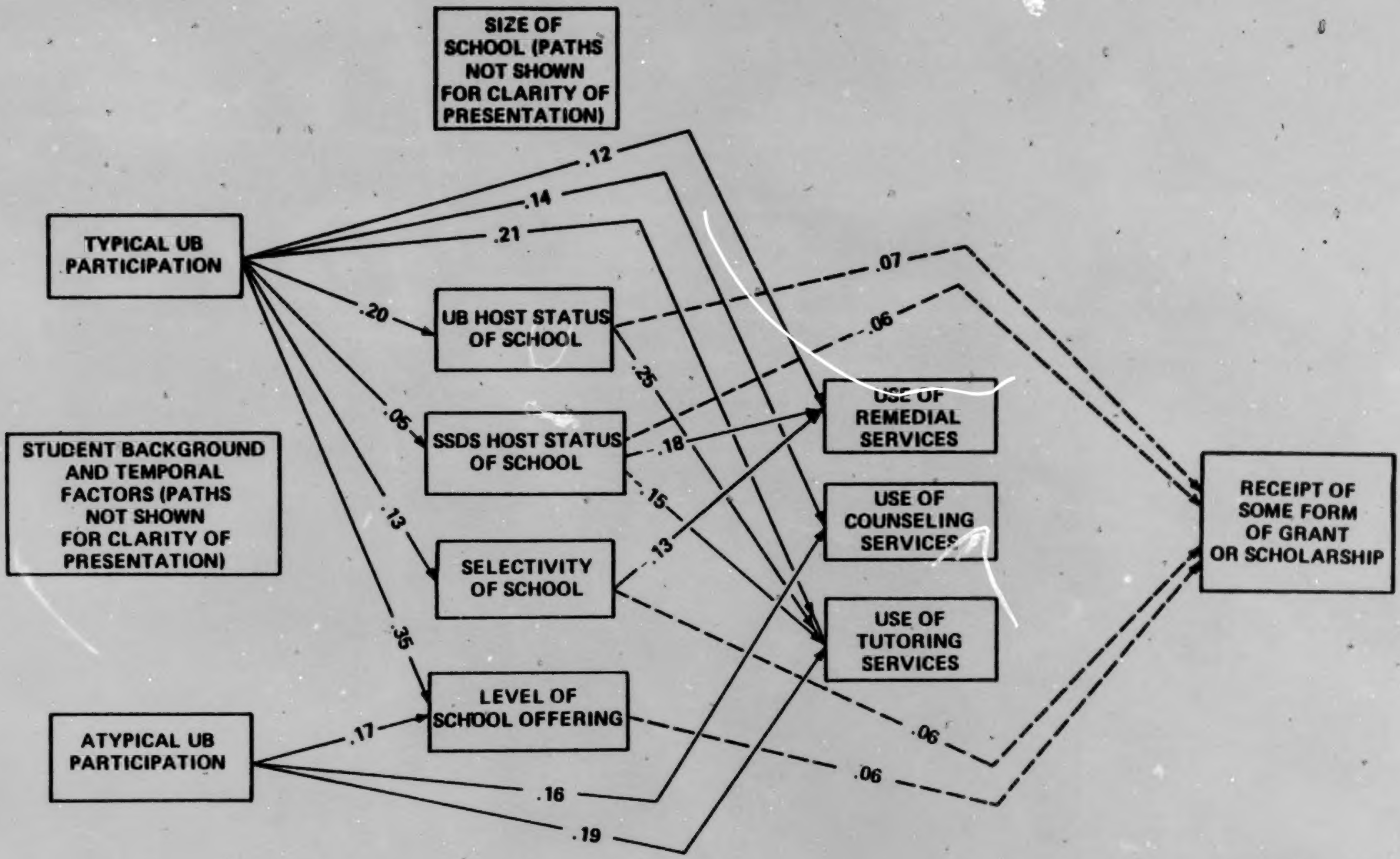
SIZE OF SCHOOL (PATHS NOT SHOWN FOR CLARITY OF PRESENTATION)
TYPICAL UB PARTICIPATION
.12
.14
.21
.20
UB HOST STATUS OF SCHOOL
.07
.06
.25
.05
SSDS HOST STATUS OF SCHOOL
.18
.15
USE OF REMEDIAL SERVICES
USE OF COUNSELING SERVICES
USE OF TUTORING SERVICES
RECEIPT OF SOME FORM OF GRANT OR SCHOLARSHIP
STUDENT BACKGROUND AND TEMPORAL FACTORS (PATHS NOT SHOWN FOR CLARITY OF PRESENTATION)
.13
SELECTIVITY OF SCHOOL
.13
.35
LEVEL OF SCHOOL OFFERING
.06
.06
ATYPICAL UB PARTICIPATION
.17
.16
.19

Figure 17. Solution for structural model predicting receipt of scholarships or grants.

Figure 17 also indicates that use of counseling services has no direct relationship to receipt of grant or scholarship. It should be noted that the counseling services considered included many types of counseling in addition to financial counseling, and the timing of the received counseling was not considered. The coefficients associated with type of institutions attended suggest greater likelihood of receiving grants/scholarships at schools with higher level-of-offering, which might be expected, but also suggests an increased likelihood of grants/scholarships receipt associated with increased institutional selectivity. Students attending UB host institutions are more likely to receive some form of grant or scholarship than those attending non-host institutions, but students attending SSDS host institutions are less likely to receive grants or scholarships than students at non-host institutions. Although not shown in Figure 17, no relationship was found between size of school and receipt of grant/scholarship.

The coefficients for student background factors that are not shown in Figure 17 are included in Table 1. There were no significant direct effects of either grade cohort or sex on the receipt of grants/scholarships; however, significant direct effects are indicated from all other background factors to this financial aid outcome. The largest coefficient is from poverty status, which is associated with an increase in the likelihood of grant/scholarship receipt of about 14 percentage points. Academic risk classification is also associated with an increased likelihood of receiving some form of grant or scholarship, which could reflect a differential aid packaging for academic risks, (including more grants and scholarships and less work study, since work could reduce the amount of time these individuals could devote to their studies). Minority status was also related to a higher likelihood of obtaining grants or scholarships; the coefficient associated with Blacks is approximately .11 and that associated with non-black minorities is approximately .09. As discussed previously, it seems more reasonable to assume that these effects may be due to unmeasured aspects of either academic risk or poverty status reflected in ethnic classification.

In considering the three remaining financial aid variables, a model was employed in which the amount of grant received (as rescaled to account for differential institutional costs) is seen as the primary form of financial aid, on which receipt or use of other financial aid elements depends. The model assumes that, given receipt of some amount of grant/scholarship monies, the next source of aid sought is loans and, following that, earnings or savings are used to round out the financial aid package. The coefficients associated with these three financial aid variables are provided in Table 1 (see also Figures 18, 19, and 20 in Subsection II.D for coefficients specific to UB participation pattern).

UB participation pattern showed no direct effect on grant amount received. Other background and temporal factors did show direct relationships to this financial aid variable. For example, poverty status was strongly related to this measure of financial aid (coefficient of .48). As with receipt of grant, academic risk status was also positively related to amount of grant/scholarship received (coefficient of .17). Student ethnicity was also associated with greater amounts of grants received; the relationship was statistically significant for non-Black minorities (coefficient of .52) but not for Blacks.

Temporal factors, reflected in grade cohort, are also related to the amount of grant/scholarship received. The coefficient associated with the tenth-grade cohort was positive, and that associated with the twelfth-grade cohort was negative. This suggests a change, over time within PSE, of amount of grant received, since grade cohort is a proxy measure for time spent in PSE. This finding is consistent with results reported in Chapter 3 and with other findings regarding a transition from grants/scholarships to loans and work as a function of time in PSE.[132]

As was the case in considering receipt of grant/scholarship, service use variables were associated with scaled amount of grants/scholarships received; however, only two of the institutional characteristics considered, selectivity and UB host status, were associated with this financial aid outcome. The coefficients for these relationships were, in both cases, positive (see Figure 18 in the following subsection).

Although UB participation shows no direct effect on the amount of scaled grant/scholarships received, it is again the case that indirect effects exist through the institutional type variables. Using the coefficients indicated in Table 1 (see also Figure 18), an overall indirect effect of .11 for typical UB participants may be estimated. No indirect effect is indicated for atypical UB participants, due to the lack of relationship between atypical participation pattern and type of institution attended.

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[132] Carroll, C. D. Packaging of Financial Aid for Students in Postsecondary Education from 1972 to 1975. Technical Paper 79-5. Washington, D.C.: Office of Evaluation and Dissemination, U.S. Office of Education, April 20, 1979.

There are positive direct effects of both typical and atypical UB participation pattern on the receipt of some form of loan, but no relationship was indicated between scaled amount of grant received and receipt of some form of loan. Variables within both the institutional type and the service use variable sets are related to receipt of loan. Among the institutional characteristics considered, level-of-offering shows a positive direct effect of .04 to receipt of loan; size shows a direct effect of -.07; and selectivity shows a direct effect of .12. The greater likelihood of receipt of loans among individuals attending institutions with higher level-of-offering and more selective institutions is not surprising; however, the reduced likelihood of receiving a loan at large institutions is less understandable. Use of counseling services was also associated with receipt of loan; greater use of counseling services was associated with an increase in the likelihood of receiving a loan of about five percentage points.

While none of the background characteristics of students were associated with loan receipt, temporal factors (reflected in grade cohort) did show such a relationship. The coefficient associated with the tenth-grade cohort, while statistically non-significant, was -.042; that associated with the twelfth-grade cohort was .05. This finding complements the previous finding for scaled grant/scholarship funds received, in suggesting a transition of aid packaging over time.

Indirect effects, through type of institution last attended and counseling use, increased the likelihood that both typical and atypical former UB participants would receive some form of loan. The net indirect effect for typical participants was about four percentage points, and that for nonparticipants was about one percentage point.

While no direct effects of UB participation pattern, poverty status, or temporal factors were suggested by the solution for use of savings or earnings, all remaining student background characteristics were significantly related to this financial aid outcome (see Table 1). Females were less likely to finance their education through savings or earnings than males, by about 17 percentage points. Similarly, those who were considered academic risks were less likely to finance education through savings or earnings, by approximately eight percentage points. This latter finding is consistent with the hypothesis advanced earlier for greater grant/scholarship amounts received by academic risks. Student ethnicity was also negatively related to the financing of education through savings or earnings, although the relationship was not statistically significant for non-Black minorities. The possible confounding of ethnicity classification with poverty status and risk status may be an explanation for these findings.

Three of the five institutional characteristics considered were significantly related to financing postsecondary education through savings or earnings. The relationship was positive for institutional level-of-offering and special services host status, but was negative for UB host status. Use of counseling services was associated with an increase in the likelihood of using savings or earnings of approximately six percentage points.

Amount of grants/scholarships received was negatively associated with using savings or earnings to finance the last year of postsecondary education, but receipt of loan was positively related to use of savings or earnings. Those who had received loans were more likely by about 20 percentage points to also have used savings or earnings in financing their education.

Indirect effects of UB participation pattern on use of savings or earnings were also observed through type of institution attended, use of counseling services, and the other financial aid outcomes.[133] The net indirect effects for both typical and atypical UB participants suggest an increase of approximately five percentage points in predicting the likelihood of financing education through savings or earnings.

D. PSE Performance, Progress, and Persistence

For purposes of the structural modeling, three measures were selected that reflect, to a large extent, either persistence, progress, or performance.[134] The persistence measure chosen was the number of terms of PSE attendance. The performance measure chosen was overall GPA (at school last attended). The measure of PSE progress chosen was total credits earned (converted to a common scale of quarter hours), and, for purposes of these analyses, this variable was rescaled to reflect termwise credits earned.[135] Solutions of the structural equations for these three PSE success measures are provided separately in the three following subsections. A summary of direct and indirect effects of UB participation pattern on all three variables is provided in Subsection II.D.4.

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[133] In respect to the other financial aid outcomes it should be recalled that, while no direct effect of Upward Bound participation on this measure was observed, there were indirect effects.

[134] The choices were not completely arbitrary, since the variables have distributional properties that are more suited to this type of analysis.

1. PSE Persistence

The model solution for number of terms of postsecondary study is depicted in Figure 18. For clarity of presentation, none of the paths for student background and temporal factors or for size of PSE institution (to which UB participation pattern was not related) are shown. As can be seen from this figure, there are no direct effects of typical or atypical UB participation on the number of terms of postsecondary study. There are, however, large indirect effects of UB participation pattern through the intermediate variables in the model (see Subsection IV.D.4).

Large coefficients are associated with two of the school type variables. Level-of-offering of institution last attended has a coefficient of 2.19 terms, indicating that, compared to individuals attending a two-year academic school (scaled as the base group), those attending a four-year college or university are expected to attend over two additional terms, and those attending vocational/technical schools are expected to attend more than two terms less.[136] In addition, individuals attending SSDS host institutions are expected to attend a full term less than those attending non-host institutions.

Only one of the service utilization variables (extent of using tutoring services) was significantly related to number of terms of postsecondary study, and the relationship (an expected increase of two-tenths of a term) was relatively small. Both scaled grant/scholarship amount and financial assistance through work or savings are related to number of terms of postsecondary study; however, no significant relationship was indicated for receipt of loan. Each increase in the scaled grant/scholarship amount is associated with an increase of about one-half term of postsecondary school attendance. Use of earnings or savings to finance PSE education is also associated with an expected increase of almost a full term of PSE attendance.

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[135] Transformation to termwise credits was accomplished by dividing total credits earned by 15, which reflects, in most cases, the credits that would be earned in a given term to allow for progression to the next highest student classification. That is, three quarters of 15 credits each would be required to progress from freshman classification to sophomore classification at most PSE institutions.

[136] This interpretation is based on the implicit assumption of interval scale properties of level-of-offering.

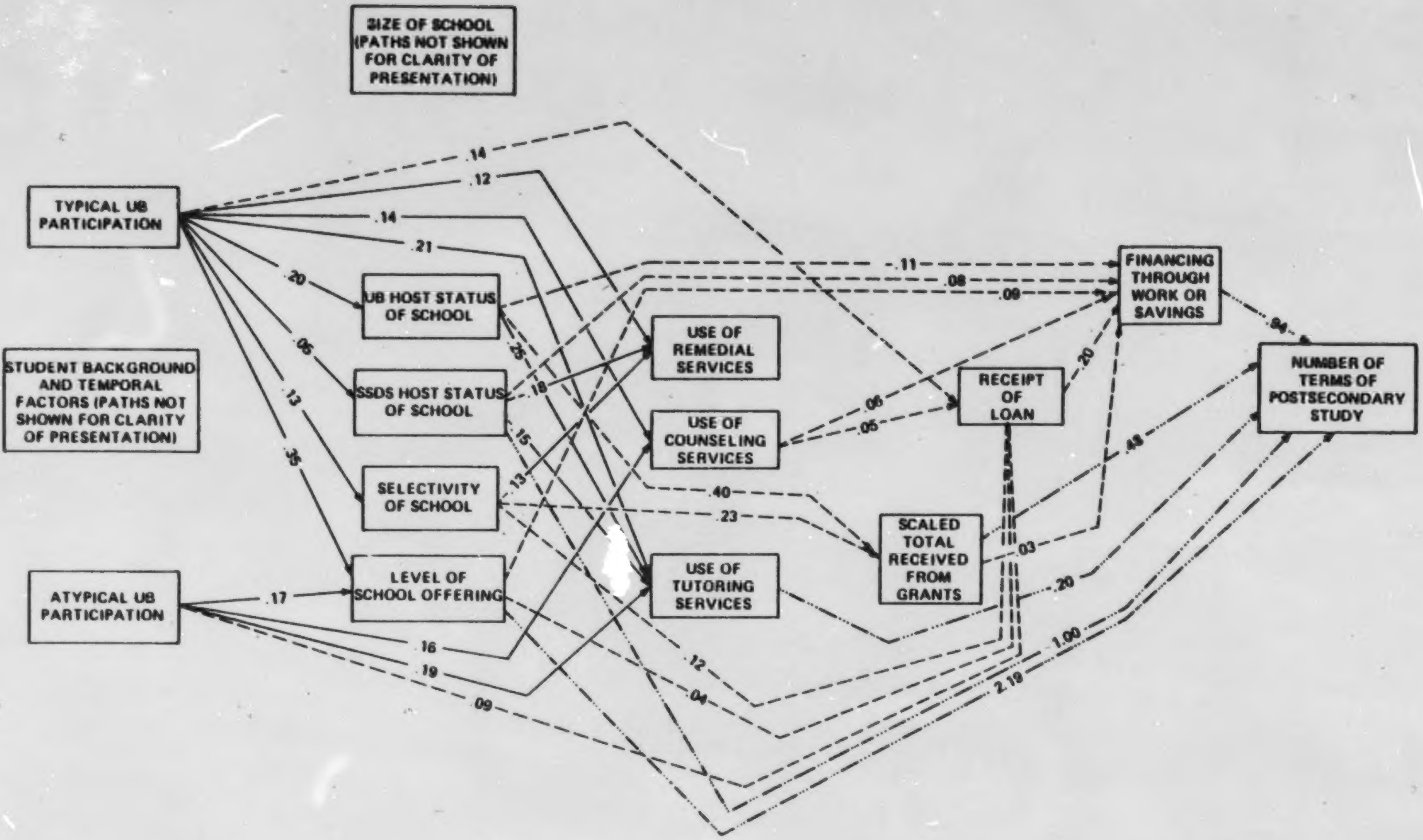
SIZE OF SCHOOL (PATHS NOT SHOWN FOR CLARITY OF PRESENTATION)
TYPICAL UB PARTICIPATION
STUDENT BACKGROUND AND TEMPORAL FACTORS (PATHS NOT SHOWN FOR CLARITY OF PRESENTATION)
ATYPICAL UB PARTICIPATION
UB HOST STATUS OF SCHOOL
SSDS HOST STATUS OF SCHOOL
SELECTIVITY OF SCHOOL
LEVEL OF SCHOOL OFFERING
USE OF REMEDIAL SERVICES
USE OF COUNSELING SERVICES
USE OF TUTORING SERVICES
RECEIPT OF LOAN
SCALED TOTAL RECEIVED FROM GRANTS
FINANCING THROUGH WORK OR SAVINGS
NUMBER OF TERMS OF POSTSECONDARY STUDY
.14
.12
.14
.21
.20
.06
.13
.35
.17
.16
.19
.09
.25
.18
.15
.13
.11
.08
.09
.06
.05
.40
.23
.20
.94
.48
.03
.20
1.00
2.19
.12
.04

Figure 18. Solution for structural model predicting number of terms of postsecondary study.

Background factors were also strongly related to number of terms of postsecondary study. Classification within the tenth-grade cohort is associated with a decrease in expected terms of attendance of about two and one-half terms, whereas classification within the twelfth-grade cohort was associated with an expected increase of 1.2 terms. Academic risk status is negatively related to number of terms of PSE attendance, as might be expected, and the extent of the expected decrease was large (about one and one-half terms less). The direct effect of poverty status on number of terms of attendance was also negative, and reduced the expected number of terms by about one-half of a term. Ethnic classification was also strongly related to number of terms of academic attendance; Blacks reported attendance for about two more terms than the white base group, while other ethnic minorities reported an increase of about one additional term of PSE attendance.

2. Postsecondary Performance

Figure 19 shows the solution to the model for postsecondary GPA of institution last attended.[137] With other terms in the model controlled, typical UB participation pattern is associated with a significant residual direct effect of -.2 grade points. Similarly, atypical UB participation pattern is associated with a decrease of about .3 grade points over that obtained by the base group of nonparticipants. There is indication of positive indirect relationships through the type of school attended and the financial aid variables, but these indirect relationships are relatively small (see Subsection II.D.4 below).

Figure 19 shows only one direct effect between type of school attended and grade point average, an expected increase of .13 grade points associated with attending a UB host institution. Not shown in Figure 19 is a negative direct effect of .10 grade points associated with size of institution last attended. Positive direct effects of no more than .20 grade points are associated with the three financial aid variables considered in the model; the greatest of these predicted increases is from financing education through earnings or savings.

The relationships of the service use variables to grade point average are negative, and are relatively small (no more than a tenth of a grade point). These negative direct relationships suggest a mis-specification of the model for grade point average. Theoretically, the use of tutoring services by needy

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[137] GPA was computed on a 5 point scale, from 0 to 4.

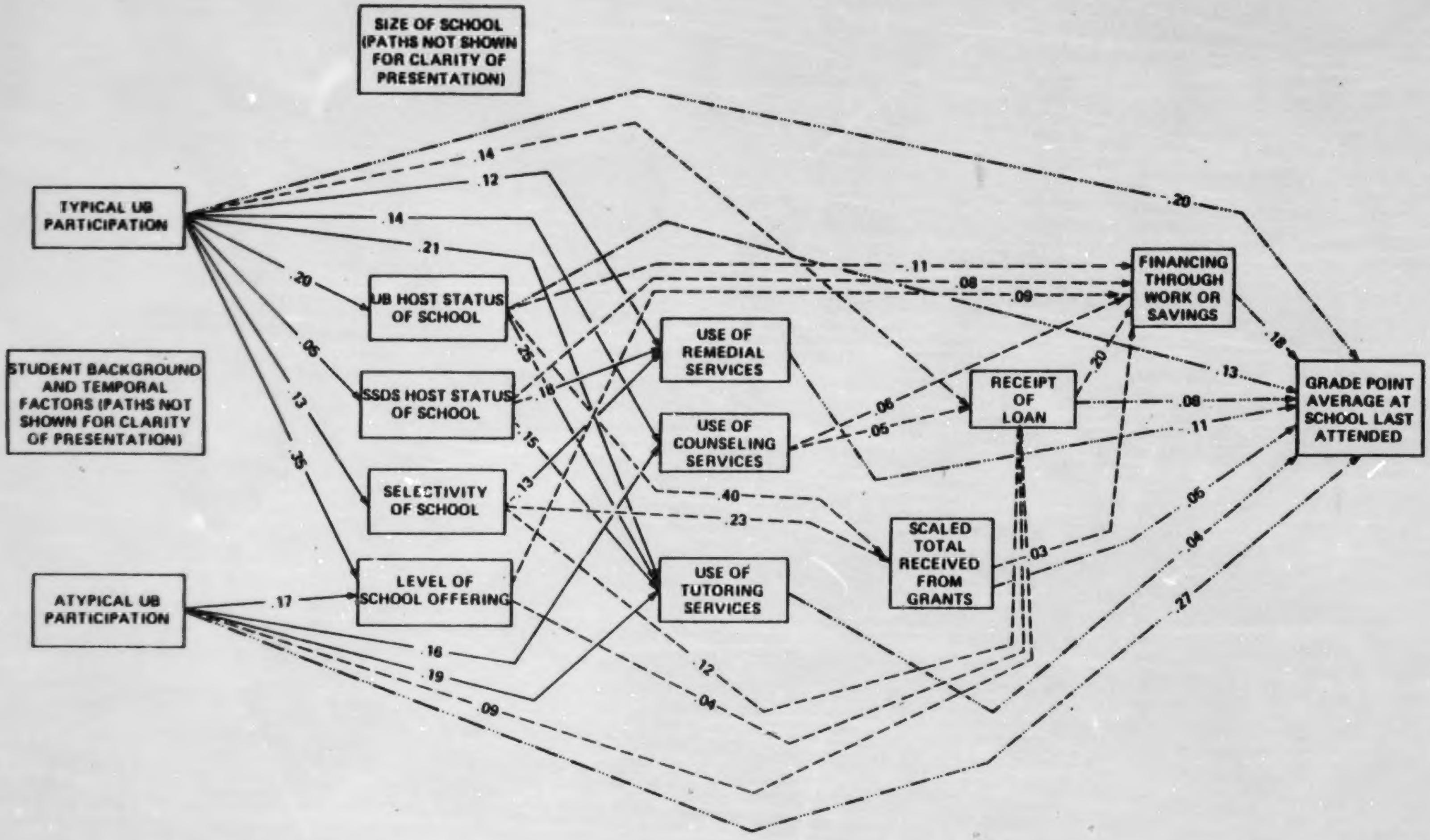
SIZE OF SCHOOL (PATHS NOT SHOWN FOR CLARITY OF PRESENTATION)
TYPICAL UB PARTICIPATION
STUDENT BACKGROUND AND TEMPORAL FACTORS (PATHS NOT SHOWN FOR CLARITY OF PRESENTATION)
ATYPICAL UB PARTICIPATION
UB HOST STATUS OF SCHOOL
SSDS HOST STATUS OF SCHOOL
SELECTIVITY OF SCHOOL
LEVEL OF SCHOOL OFFERING
USE OF REMEDIAL SERVICES
USE OF COUNSELING SERVICES
USE OF TUTORING SERVICES
RECEIPT OF LOAN
SCALED TOTAL RECEIVED FROM GRANTS
FINANCING THROUGH WORK OR SAVINGS
GRADE POINT AVERAGE AT SCHOOL LAST ATTENDED
.14
.12
.14
.21
.20
.05
.13
.35
.17
.25
.18
.15
.13
.11
.08
.09
.06
.05
.40
.23
.20
.20
.18
.13
.08
.11
.05
.03
.04
.27
.16
.19
.09
.12
.04

Figure 19. Solution for structural model predicting postsecondary grade point average.

individuals should increase grade point average; a similar relationship would be expected for use of remedial services.[138] The values reported in Figure 19 may, therefore, reflect that, compared to individuals who do not need tutoring (or remedial) services, those who need (and therefore use) such services have lower grade point averages (a mis-specification of directionality).

Although temporal factors, as reflected in grade cohort classification, showed no significant direct effects on GPA, all of the student background variables under consideration showed significant effects. Females averaged about one tenth of a grade point higher than males, and academic risks averaged about one-half of a grade point lower than non-risks. Poverty level status was associated with a reduction in expected GPA of about one tenth of a grade point. Student ethnicity was also negatively related to GPA; the expected reduction in GPA associated with minority status was two tenths of a grade point for both Blacks and non-Black minorities.

3. Postsecondary Progress

Figure 20 shows the model solution for termwise credits earned. Both typical and atypical UB participation show significant negative direct effects on this progress measure (about one-half of a term's credit for each group). There is also a suggestion in Figure 20 of rather large indirect effects of UB participation pattern on termwise credits earned, particularly through the type of PSE institution last attended (see Subsection II.D.4 below).

All five of the institution type classifications were significantly related to total credits earned; the largest expected increase was associated with institutional level-of-offering (coefficient of 2.50). While not shown in Figure 20, school size was negatively related to total termwise credits earned (coefficient of -.33). Increases in termwise credits earned associated with selectivity and UB host status of institution last attended were as expected; however, the decrease of more than one-half of a term's credit associated with SSDS host status seems counter-intuitive.

Use of counseling services was the only service use variable significantly related to total termwise credits earned, with a coefficient of -.31. The negative relationship again probably reflects a mis-specification of the model. All three of the financial aid variables show positive direct effects

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[138] The theoretical argument assumes an interaction of extent of service use and need for use of that service, and interaction terms were not included in the structural model under consideration.

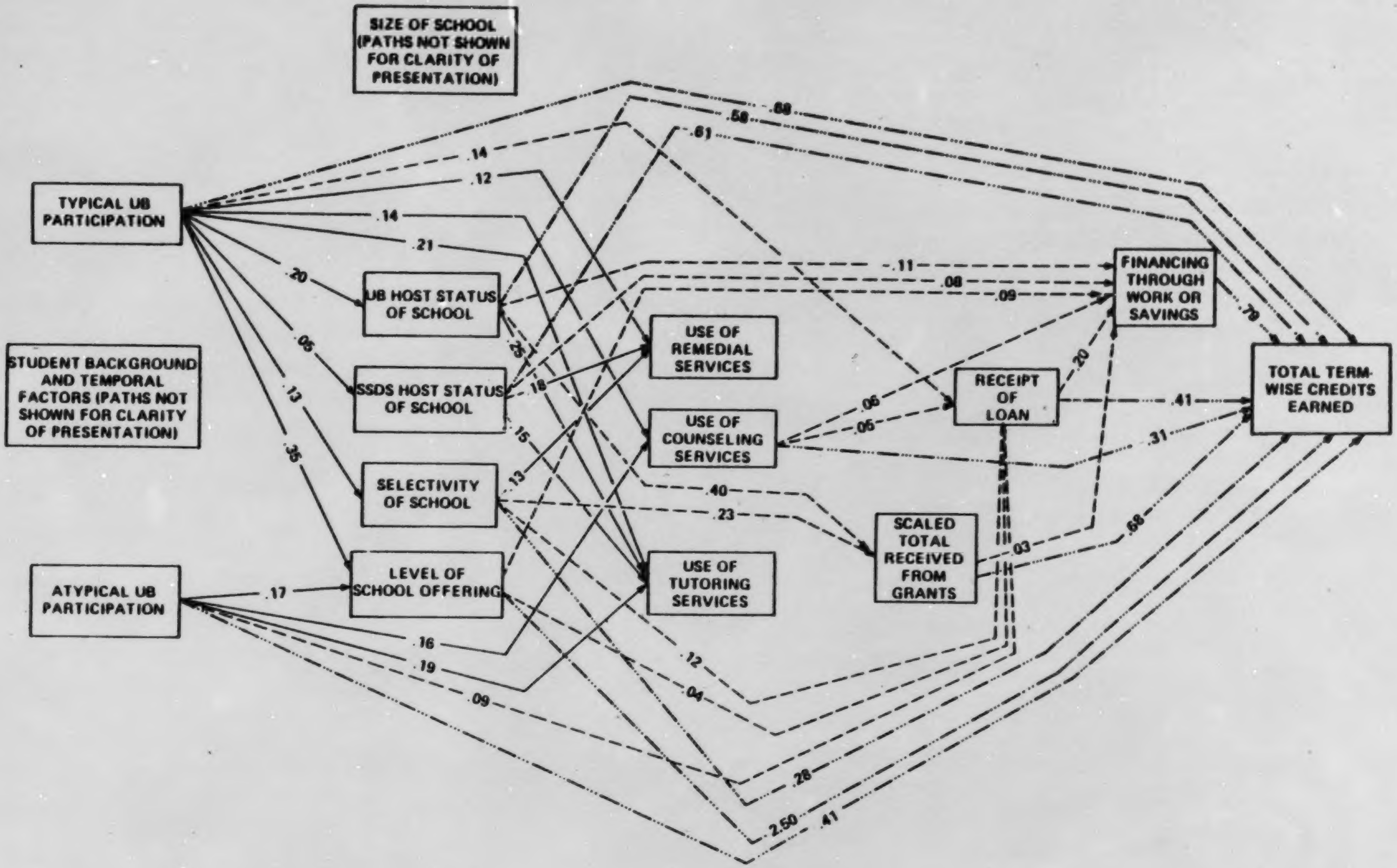
SIZE OF SCHOOL (PATHS NOT SHOWN FOR CLARITY OF PRESENTATION)
TYPICAL UB PARTICIPATION
STUDENT BACKGROUND AND TEMPORAL FACTORS (PATHS NOT SHOWN FOR CLARITY OF PRESENTATION)
ATYPICAL UB PARTICIPATION
UB HOST STATUS OF SCHOOL
SSDS HOST STATUS OF SCHOOL
SELECTIVITY OF SCHOOL
LEVEL OF SCHOOL OFFERING
USE OF REMEDIAL SERVICES
USE OF COUNSELING SERVICES
USE OF TUTORING SERVICES
RECEIPT OF LOAN
SCALED TOTAL RECEIVED FROM GRANTS
FINANCING THROUGH WORK OR SAVINGS
TOTAL TERMWISE CREDITS EARNED
.68
.58
.61
.14
.12
.14
.21
.20
.05
.13
.35
.17
.16
.19
.09
-.11
.08
.09
.25
.18
.15
.13
.06
.05
.41
.31
.40
.23
.03
.68
.20
.79
.12
.04
.28
2.50
.41

Figure 20. Solution for structural model predicting total termwise postsecondary credits earned.

on total credits earned; each aid element increasing the expected total by greater than four tenths of a term's credit. The increase of .68 term's credit associated with total grants/scholarships may be deceiving, considering that this variable is measured on a five-valued scale. Under the interval scale property assumed for the total grant/scholarship variable, this would indicate an increase of about two-thirds of a term's credit for each successive value of grant received, or an increase of about three and one-half terms (over a year) between the lowest value (no grants/scholarships received) and the highest total grant/scholarship value.

As would be expected, temporal factors were associated with total termwise credit earned. Tenth-grade cohort classification was associated with a decrease of about one full year's worth of credits, as compared to the base group (eleventh-grade cohort); on the other hand, twelfth-grade cohort classification was associated with an increase of about one full term's credit.[139]

Among the student background characteristics, only sex was not associated with a significant direct effect on termwise credits earned. Both poverty status and academic risk status were associated with a decrease in total credits earned, poverty status with an expected decrease of about one complete year's credit and academic risk associated with a decrease of about two term's credit. Blacks were expected to earn one term more credits than the white base group, while the relationship associated with other ethnic minorities was not statistically significant.

4. Direct and Indirect Effects Associated with Measures of PSE Performance, Progress, and Persistence

As indicated in the previous subsection, direct relationships between UB participation and the outcome measures considered can be misleading without consideration of indirect effects through the three intervening variable sets (school type, service use, and financial aid). These figures can be obtained through multiplication of the coefficients associated with the indirect paths in Figures 18, 19, and 20; however, those coefficients do not reflect the additional indirect relationships that are possible through the nondirectional paths (not shown) among the variables within a particular set (for example, the relationships among the service use variables).[140] An alternate approach

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[139] As with number of terms attended, the results suggest a non-linear relationship over the grade cohorts considered.

[140] While such relationships have been allowed in the structural model solution, they are not reflected in the solution for coefficients that have been shown in Figures 18, 19, and 20.

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to obtaining these indirect effects is through solving a model that does not involve the intervening variables, but that does include the background and temporal factors.[141] Direct and indirect effects, for each of three PSE outcomes considered in this subsection, computed by the alternate approach, are reported in Table 2. With the exception of GPA, the indirect effects of UB participation pattern (through the intervening variables) are considerably larger than the direct effect. Further, the total indirect effects associated with typical UB participation pattern are generally greater than those associated with atypical participation pattern.

As indicated previously and shown in Table 2, there is no direct effect of UB participation pattern on terms of PSE attendance; however, the overall relationship between typical participation and number of terms attended suggests an increase of more than a full term. This is due exclusively to indirect relationships, principally the relationships through school types. For atypical UB participants, the situation is similar; however, the overall relationship is smaller (about a third of a school term increase). The direct effects on credits earned are negative for both typical and atypical UB participants; however, indirect effects are positive in both cases, to the extent that the overall effect (direct and indirect) of typical UB participation is an increase of almost two-thirds of a term, as compared to the nonparticipant base group. The overall relationship for the atypical participants is effectively zero. The total indirect effects on grade point average are small (relative to the direct relationships); however, the indirect relationships through the intervening variables associated with both typical and atypical UB participation are positive.

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[141] The unique relationship between typical and atypical UB participation as shown through such an alternate solution will reflect the overall relationship between UB participation and the outcome variable of interest. The total indirect effect can then be obtained by subtracting the direct effect (obtained in the full modeling) from the total overall relationship (obtained in the alternate model). Moreover, assuming that the relative contribution of school type, service use, and financial aid to the total indirect effect is proportionally equivalent for the alternate solution and the direct solution (obtained through multiplication of the coefficients), one can estimate the unique contributions of each of these three classes of variables on outcome measures of interest within the alternate approach.

Table 2

Estimated Direct and Indirect Relationships Of UB Participation Pattern to Three PSE Outcomes

	Variable Considered					
	Number of Terms Attended		GPA		Termwise Credits Earned	
Relationships	Typical Participants	Atypical Participants	Typical Participants	Atypical Participants	Typical Participants	Atypical Participants
Direct	0	0	-.200	-.269	-.679	-.414
Indirect						
School type	.886	.298	.050	0	1.178	.435
Service use	.062	.029	-.039	-.001	-.053	-.049
Financial aid	.127	.033	.055	.018	.220	.077
Total indirect	1.075	.360	.066	.017	1.345	.463
Overall	1.075	.360	-.134	-.252	.666	.049

III. ADDITIONAL MODELING AND IMPLICATIONS

The solution presented in the previous section assumed equal (and implicitly perfect) reliabilities of the measures in the model; however, this assumption is quite tenuous in light of what is known about the data elements. The reliabilities of the poverty status and academic risk indices are considered less than those of other student background characteristics. Moreover, differential reliability of the various elements used in the model has been suggested in Chapter II (see also Appendix E). For this reason, additional analyses of the model were conducted with estimates of differential reliabilities of the various elements of the model.

Accurate reliability estimates were not available for most variables, and it was necessary to make subjective estimates of the reliability in such cases (see Appendix I). This introduces error of a completely different type into the model solution.[142] For that reason, the solution presented in this section should not be considered more accurate than the solution presented previously.[143]

The solution to the model, under assumptions of differential reliability, is presented in Table 3. Comparing the values in Table 3 to those previously reported in Table 1, it can be observed that the general nature of the model solutions are similar. Some of the previously significant coefficients no longer differ significantly from zero under these assumptions of reliability, and a few of the previously non-significant coefficients show significance in the current solution. In general, the differences between the model solution shown in Table 3 and that shown in Table 1 are: (1) estimates of direct effects associated with typical and atypical UB participation pattern are typically larger; (2) estimates of direct effects associated with ethnicity are typically larger; and (3) relationships leading from the intervening variables are, in many cases, less pronounced.

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[142] While the stability of the model for this particular set of data was not examined for other estimates of differential reliability, many studies have indicated that structural model solutions may differ rather markedly with the use of different sets of reliability estimates.

[143] For this model also, the number of potential free parameters was very large, and estimated costs for a simultaneous solution could not be absorbed in the project budget. For that reason, the solution was obtained in a stepwise manner by adding variable sets one at a time (in the order that they appear in the model). As a solution was obtained for one set of variables, these values were fixed for solutions to subsequent variable sets, thus reducing the number of free parameters estimated at any time (see Appendix I).

Table 3

General Solutions for the Structural Model with Differential Reliabilities

Predictor Variables	Criterion Variables														
	Institutional Level-of-Offering	Institutional Size	Institutional Selectivity	Institutional UB Host Status	Institutional SSDS Host Status	Extent of Tutoring Use	Extent of Remedial Services Use	Extent of Counseling Use	Receipt of Grant	Adjusted Grant Amount	Receipt of Loan	Use of Savings or Earnings	Number of Terms Attending PSE	Termwise Credits Earned	Grade Point Average
Typical UB Participants a/	.434	0	.179	.242	0	.239	0	.148	0	0	.160	0	0	-1.073	-.300
Atypical UB Participants a/	.270	0	.118*	.069*	0	.256	0	.189	0	0	.096*	0	0	-.825	-.446
Tenth-Grade Cohort a/	0	0	-.168	0	0	0	0	0	0	.325	0	0	-2.871	-2.231	0
Twelfth-Grade Cohort a/	0	0	-.010*	0	0	0	0	0	0	-.137*	0	0	1.256	.852	0
Female a/	-.125	0	-.165	0	.062	0	0	0	0	0	0	-.174	0	.331	.152
Academic Risk a/	-.140	0	-.122	0	0	0	.257	0	.124	.193	0	-.079	-1.681	-2.226	-.422
Black a/	0	.266*	-.473	0	.228	.714	.759	.465	.220	.330*	0	-.229	3.318	1.238	-.353
Other Nonwhite a/	0	.872	-.227	0	.443	.592	.546	.319	.197	.722	0	-.155*	2.301	.071*	-.432
Poverty Status a/	0	-.434	0	.152	0	0	0	0	.163	.679	0	0	-1.096	-1.062	-.198
Institutional Level-of-offering b/	--	--	--	--	--	0	0	0	0	0	0	.080	2.649	3.373	0
Institutional Size b/	--	--	--	--	--	0	0	-.079	-.085	0	-.111	.038	0	-.436	-.117
Institutional Selectivity b/	--	--	--	--	--	0	0	0	.195	.401	.240	0	0	0	0
Institutional UB Host Status c/	--	--	--	--	--	.248	0	0	.068	.362	0	-.081	-.438	0	.114
Institutional SSDS Host Status c/	--	--	--	--	--	-.164	-.199	0	0	0	0	.067	-1.159	-.780	0
Extent of Tutoring Use b/	--	--	--	--	--	--	--	--	0	0	0	-.060	.223	0	0
Extent of Remedial Services Use b/	--	--	--	--	--	--	--	--	0	0	-.079	0	0	0	-.233
Extent of Counseling Use b/	--	--	--	--	--	--	--	--	0	0	.122	.112	0	-.388	.122
Adjusted Grant Amount b/ d/	--	--	--	--	--	--	--	--	--	--	0	-.049	.723	1.052	.093
Receipt of Loan c/	--	--	--	--	--	--	--	--	--	--	--	.285	0	.512	0
Use of Work, Savings, or Earnings c/	--	--	--	--	--	--	--	--	--	--	--	--	1.410	1.263	.269

NOTE: An asterisk (*) is used to indicate lack of statistical significance for one of a pair of related dummy variable contrasts; otherwise, zero (0) indicates statistical nonsignificance.

a/ These variables represent dummy variable codings of categorical variables; the base group is implied.

b/ These variables are treated as continuous.

c/ These variables are dichotomous.

d/ Adjusted to a five-valued scaling on the basis of amount of grant/scholarship received and institutional cost.

Direct and indirect effects attributable to UB participation pattern (as compared to the base group of nonparticipants) are provided in Table 4. The relative stability of the model solution is again suggested by comparison of Table 4 with Table 2. Like Table 2, Table 4 indicates a net overall positive effect of UB participation on number of terms of PSE attendance. Also, the magnitude of the indirect effect on number of credits earned is sufficiently large to produce an overall net positive effect of UB participation pattern on this outcome. Finally, the positive indirect effect on total GPA is relatively small compared to the negative direct effect of UB participation pattern on this PSE outcome.

One different feature of Table 4, as compared to Table 2, is the larger indirect effects of atypical UB participation pattern. Relative to the indirect effects for typical UB participants, those associated with atypical participants are generally larger in the present solution. This situation was reversed for the solution provided in the previous section.

On balance, the solution to the model is relatively stable, for the two specific sets of reliability values assumed. Both solutions are generally supported by the results of the analyses reported in Chapter 3, and both solutions are plausible. Both solutions suggest that the indirect effects on postsecondary outcomes attributable to UB participation pattern are positive. The models further suggest attendance at different types of institutions, differential use of available services, and differential receipt of financial aid as a function of former UB participation. Indirect effects also contribute to the differences in service use and receipt of financial aid. The model solutions suggest that, given control for the institutional setting (including use of services and financial aid received), UB participants are no more successful in PSE than nonparticipants in respect to the particular measures of progress, persistence, and performance examined (in some cases, the residual relationship is negative). Due to the differential institutional setting in which former UB participants are placed, however, indirect effects are suggested by the model, and the overall effects of UB participation on the measures of PSE success examined are generally positive for all measures except total GPA.

Table 4

Estimated Direct and Indirect Relationships Of UB Participation Pattern To Three PSE Outcomes For Model Assuming Differential Reliabilities

Relationships	Variable Considered					
	Number of Terms Attended		GPA		Termwise Credits Earned	
	Typical Participants	Atypical Participants	Typical Participants	Atypical Participants	Typical Participants	Atypical Participants
Direct	0	0	-.300	-.446	-1.073	-.825
Indirect						
School type	1.185	1.425	.031	0	1.677	2.162
Service use	.061	.114	.019	.078	-.064	-.173
Financial aid	.245	.096	.037	.030	.424	.128
Total indirect	1.491	1.635	.087	.108	2.035	2.117
Overall	1.491	1.635	-.213	-.338	.962	1.292

Chapter 5

Summary and Conclusions

I. GENERAL

This report has presented findings from the third of a series of studies by RTI of the UB program. The initial, base-year, study was conducted between September 1973 and December 1974. A first follow-up study was conducted between October 1976 and September 1977. The present, second follow-up, study was conducted between April 1978 and September 1979 to investigate long-term educational outcomes, concentrating on the PSE experiences that were not addressed in the two previous studies. Sufficient time had passed prior to second follow-up data collection to allow completion of a four-year PSE program by the most advanced student cohort. All three studies focused on a sample of 3,710 tenth-, eleventh-, and twelfth-grade UB participants selected from a sample of the 333 regular UB projects operating in the coterminous United States during the 1973-74 program year and a sample of 2,340 nonparticipating comparison students selected within the same grades from the schools that the UB participants were attending at that time.

The second follow-up study further examined the complex interrelationships among: program participation pattern, background and temporal factors; PSE context; support service use; financial aid components; and PSE progress, persistence, and performance. Data for this study were collected through a mail survey questionnaire to eligible base-year sample members and through telephone interviews with a subsample of nonrespondents to the mail survey. Data were also obtained from student transcripts collected from the PSE institutions last attended by respondents to the questionnaire or telephone interview. Other data were obtained from existing sources: the base-year and first follow-up student master file, a PSE institutional data file, and USOE records. The overall response rate to the mail and telephone survey was 73 percent and statistically represented 88 percent of those eligible. Transcript requests were honored in 87 percent of the cases. The extent of indeterminate and inconsistent data was small, and estimated reliabilities of key measures were well within acceptable limits.

Two conceptually different approaches to analysis were undertaken (both of which differed from analytic techniques employed in the base-year and first follow-up studies). The first approach was a hypothesis-testing approach and may be characterized as comparative/descriptive analysis. This approach addressed questions of national program impact by comparing outcomes of UB participants to those of nonparticipants, after statistically adjusting (or otherwise controlling) for relevant background and temporal factors and some PSE contextual differences. The second analytic procedure was an exploratory structural equation approach. This approach attempted to better exploit the multivariate nature of the data, at the expense of making many more assumptions, through a posited model of relationships among several sets of variables: UB programmatic factors; background and temporal factors; PSE context; support service use; financial aid; and PSE persistence, progress, and performance outcomes.

Throughout the study, care was taken to avoid techniques of data collection, processing, or analysis that would introduce bias into the study results. There are, however, certain limitations imposed on the findings that reflect limitations of the data or of the procedures used in conducting the study; some additional constraints stem from the original base-year design and the limited changes that were possible in a follow-up study. Moreover, the data were collected through survey methodologies and are subject to the errors that are common to these methods (less than complete survey coverage, less than 100 percent response rates, reduced data quality due to use of mailed instruments, and use of unverified self-reports).

The developed measures of educational progress and persistence have some weaknesses. They are interrelated and time bound, reflecting not only progression/persistence in the educational system but also the timing or pace of that progression. There is also a basic underlying constraint associated with the relationship between pattern of UB participation and educational progress/persistence.

The structural equations approach used in modeling PSE outcomes requires many assumptions about the nature of the model and of the variables used. These assumptions are questionable in some cases. The choice of analysis techniques was guided by time and budget considerations as well as by the need for easily interpretable results; however, none of the techniques used are capable of definitively establishing causation. Within the nonexperimental

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paradigm of this study, relationships can be established, but it is improper to consider such relationships as causal, since other unconsidered or unmeasured variables may be the true causal agents.

II. OVERVIEW OF MAJOR FINDINGS

The results of the second follow-up study are quite consistent with those of the base-year and first follow-up studies in suggesting UB program impact on educational aspirations or expectations, PSE progress, and persistence. Moreover, with respect to progress and persistence, the indicated program impact appears to be focused at the transition step between high school completion and postsecondary entry. There was no clear indication of program effect on high school completion, although the overall rates are high. Further, progress/persistence, subsequent to PSE entry, reflected the higher rate of entry or the influence of PSE context factors (which are different for program participants and nonparticipants) more than any influence attributable uniquely to former UB participation. In this connection, former program participants entered four-year institutions, more selective institutions, institutions hosting UB and SSDS programs, and institutions with traditional or predominant ethnic minority student bodies at greater rates than nonparticipants. Additionally, former participants reported receiving more adequate financial aid and greater use of available support services than nonparticipants.

Suggested program impact on the outcomes considered is also related to pattern of former participation in the UB program. Individuals with typical former participation patterns (i.e., participation in grades 11 and 12 or grades 10, 11, and 12) generally exhibit more positive outcomes than those with atypical participation patterns (i.e., any other pattern), for whom outcomes more closely resemble those of the nonparticipant group. An exception to this finding involves those participating only in the twelfth grade, for whom outcomes are generally more like those of typical participants than other atypical participation pattern groups. This suggests a unique program benefit associated with twelfth-grade participation, which is consistent with first follow-up study results.

The patterns of educational progress for typical UB participants and nonparticipants are presented in Figure 21. The values reported are composites from results for those in the twelfth-grade cohort, who are over four and

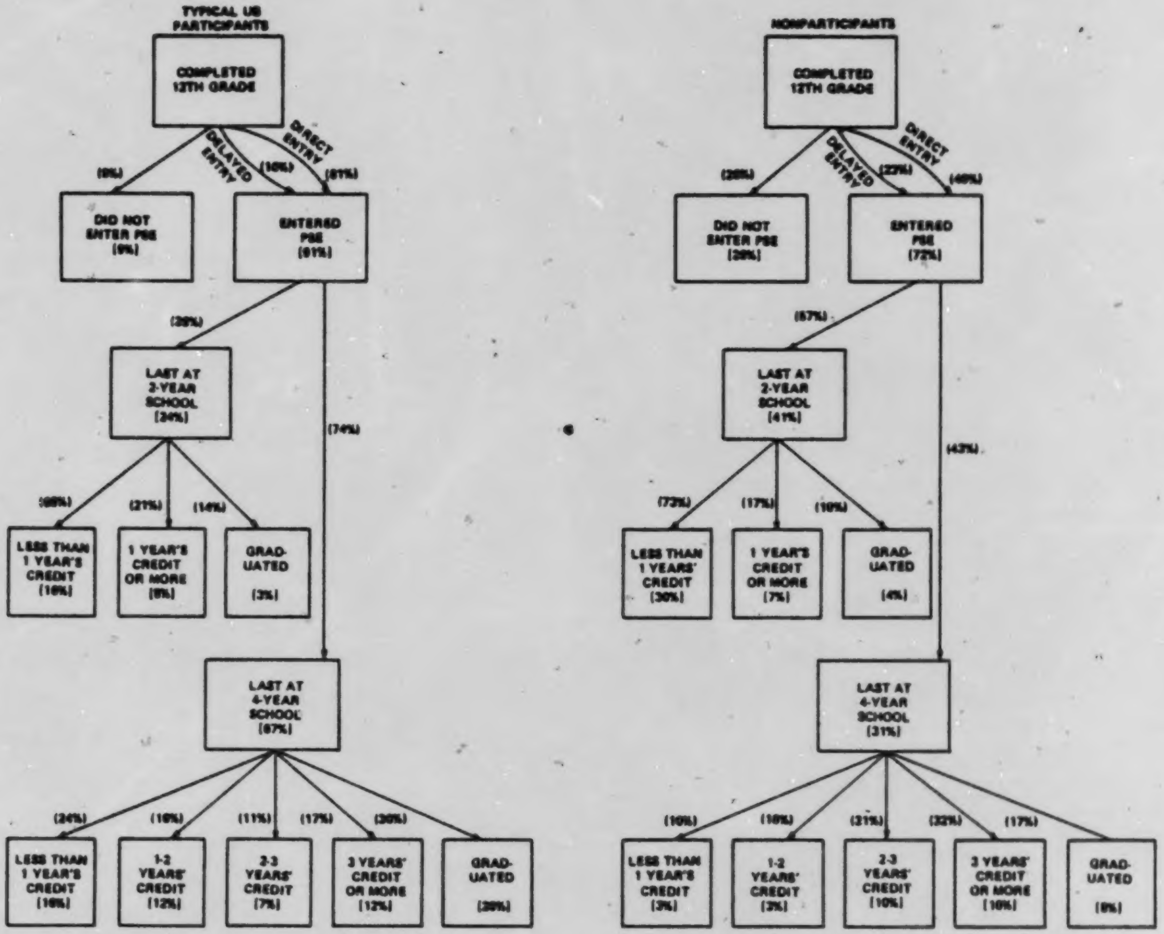
TYPICAL UB PARTICIPANTS
COMPLETED 12TH GRADE
DELAYED ENTRY
DIRECT ENTRY
(9%)
(10%)
(81%)
DID NOT ENTER PSE (9%)
ENTERED PSE (91%)
(26%)
(74%)
LAST AT 2-YEAR SCHOOL (24%)
(65%)
(21%)
(14%)
LESS THAN 1 YEAR'S CREDIT (16%)
1 YEAR'S CREDIT OR MORE (5%)
GRAD-UATED (3%)
LAST AT 4-YEAR SCHOOL (67%)
(24%)
(18%)
(11%)
(17%)
(30%)
LESS THAN 1 YEAR'S CREDIT (16%)
1-2 YEARS' CREDIT (12%)
2-3 YEARS' CREDIT (7%)
3 YEARS' CREDIT OR MORE (12%)
GRAD-UATED (20%)
NONPARTICIPANTS
COMPLETED 12TH GRADE
DELAYED ENTRY
DIRECT ENTRY
(28%)
(27%)
(45%)
DID NOT ENTER PSE (28%)
ENTERED PSE (72%)
(57%)
(43%)
LAST AT 2-YEAR SCHOOL (41%)
(73%)
(17%)
(10%)
LESS THAN 1 YEARS' CREDIT (30%)
1 YEAR'S CREDIT OR MORE (7%)
GRAD-UATED (4%)
LAST AT 4-YEAR SCHOOL (31%)
(10%)
(10%)
(21%)
(32%)
(17%)
LESS THAN 1 YEAR'S CREDIT (3%)
1-2 YEARS' CREDIT (3%)
2-3 YEARS' CREDIT (10%)
3 YEARS' CREDIT OR MORE (10%)
GRAD-UATED (5%)

Figure 21. Composite of educational progress of typical Upward Bound participants and nonparticipants.

one-half years removed from high school, and include: (1) conditional rates of advancing to a subsequent educational level given attainment of a previous level (in parentheses); and (2) percentages of the original groups attaining each educational level (in brackets). Figure 21 shows that, while neither group exhibits normal educational progress, the greater overall progress of typical program participants is primarily attributable to the greater rates at which they enter PSE and to their greater propensity to attend four-year institutions.

Differences in conditional rates of progress within two-year institutions were not significantly different and, with the exception of graduation rate, conditional rates of progress within four-year schools were greater for the nonparticipant group. Similar patterns were observed for the tenth and eleventh grade cohort, although overall progress was generally less. This is somewhat surprising, given the earlier entry into PSE (greater direct entry rate) of the typical UB participants. (Although not shown in Figure 21, within both groups 10 percent of those who graduated from a four-year institution had entered post-graduate training.)

III. SUMMARY AND INTERPRETATION OF SPECIFIC FINDINGS

A. Educational Aspirations and Expectations

Typical UB participants indicate higher educational aspirations than either atypical participants or nonparticipants; over 80 percent of the former aspire to at least a four-year college degree, but less than two thirds of the latter groups report such aspirations. Additionally, over 70 percent of the typical participants expect to obtain this level of education, compared to 60 percent of the atypical participants and 50 percent of the nonparticipants. These differences are principally attributable to greater percentages of typical participants aspiring to and expecting postgraduate study, and to correspondingly lower aspiration and expectation rates for vocational/technical school or high school only. The results are consistent with base-year and first follow-up results, although expectations for both the UB participants and nonparticipants show an increase over time.

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B. Educational Deterrents

Substantial numbers of UB particiants and nonparticipants experienced, to some extent, problems in obtaining their desired education; however, participants reported experiencing more difficulty as a result of poor grades, poor high school preparation, and lack of personal or family finances. Similar results were obtained in the first follow-up study. The higher educational aspirations and expectations of UB participants could explain their increased perceptions of problems in these areas. Also, participants could be more sensitized to such problems since they receive considerable counseling on how to deal with actual or anticipated educational problems.

C. High School Completion

High school completion rates for all participation pattern groups were quite high. For UB participants, completion percentages were 96, 97, and 99 for the tenth-, eleventh-, and twelfth-grade cohorts, respectively; corresponding percentages for nonparticipants were 93, 96, and 96. While completion rates of participants were uniformly greater than those of nonparticipants, differences are small and in most cases are not significant. These results are consistent with those from the first follow-up study, although the passage of time was associated with increases in the completion rate for all groups.

Atypical participants (excluding those who participated during the twelfth grade) showed almost identical completion rates as nonparticipants, while virtually all (over 99 percent) of the former participants who actively participated during the twelfth grade completed high school. Since typical participants progressed through the twelfth grade by definition and since atypical participants and nonparticipants are not assured such progression, the suggested advantage of typical UB participants in high school completion may be artificial.

D. Entry into Postsecondary Education

Findings regarding PSE entry are consistent with first follow-up results. Among those who had completed high school, the percentages of UB participants in the tenth-, eleventh-, and twelfth-grade cohorts entering some form of PSE were 82, 83, and 88, respectively; the corresponding percentages for nonparticipants were 74, 64, and 72. Differences in the PSE entry rates of typical participants and nonparticipants were more pronounced. PSE entry rates for UB participants who did not participate during the twelfth grade are comparatively low and more closely resemble those for nonparticipants.

Differences among five UB participation pattern groups in the rates of direct PSE entry (i.e., entry into PSE immediately on completion of high school or with only an intervening summer) were even more dramatic. Substantial proportions of those who did not enter PSE directly after high school entered after some delay; within the twelfth-grade cohort, these rates were higher for former participants (53 percent) than for nonparticipants (38 percent).

E. Types of PSE Institutions Attended

Typical UB participants attend different types of postsecondary schools than atypical participants or nonparticipants. As shown in Figure 22, typical participants reported attendance at four-year colleges and universities at considerably higher rates (73 percent) than either atypical participants (54 percent) or nonparticipants (50 percent). Typical participants also attend institutions with traditional or predominant ethnic minority student bodies, more selective institutions, and institutions hosting UB and SSDS programs at greater rates. These findings are consistent with the first follow-up study results and indicate that typical participants are functioning within different institutional settings than atypical participants and nonparticipants.

The considerably higher rate at which typical participants attend UB host institutions cannot be explained by proximity since the nonparticipant sample was drawn from the same locations as the participant sample. Host institutions are committed to the program and to serving its participants, and rates of attendance of former participants at host institutions are disproportionately large relative either to the nonparticipant enrollment or to the proportion of host institutions in the population of institutions. It is suspected that at least part of this difference is attributable to the fact that a fairly large number of UB participants are admitted to the particular institution that served as host for the specific UB project in which they participated. The higher former participant attendance rates at traditionally black institutions, SSDS host institutions, and more selective institutions may be

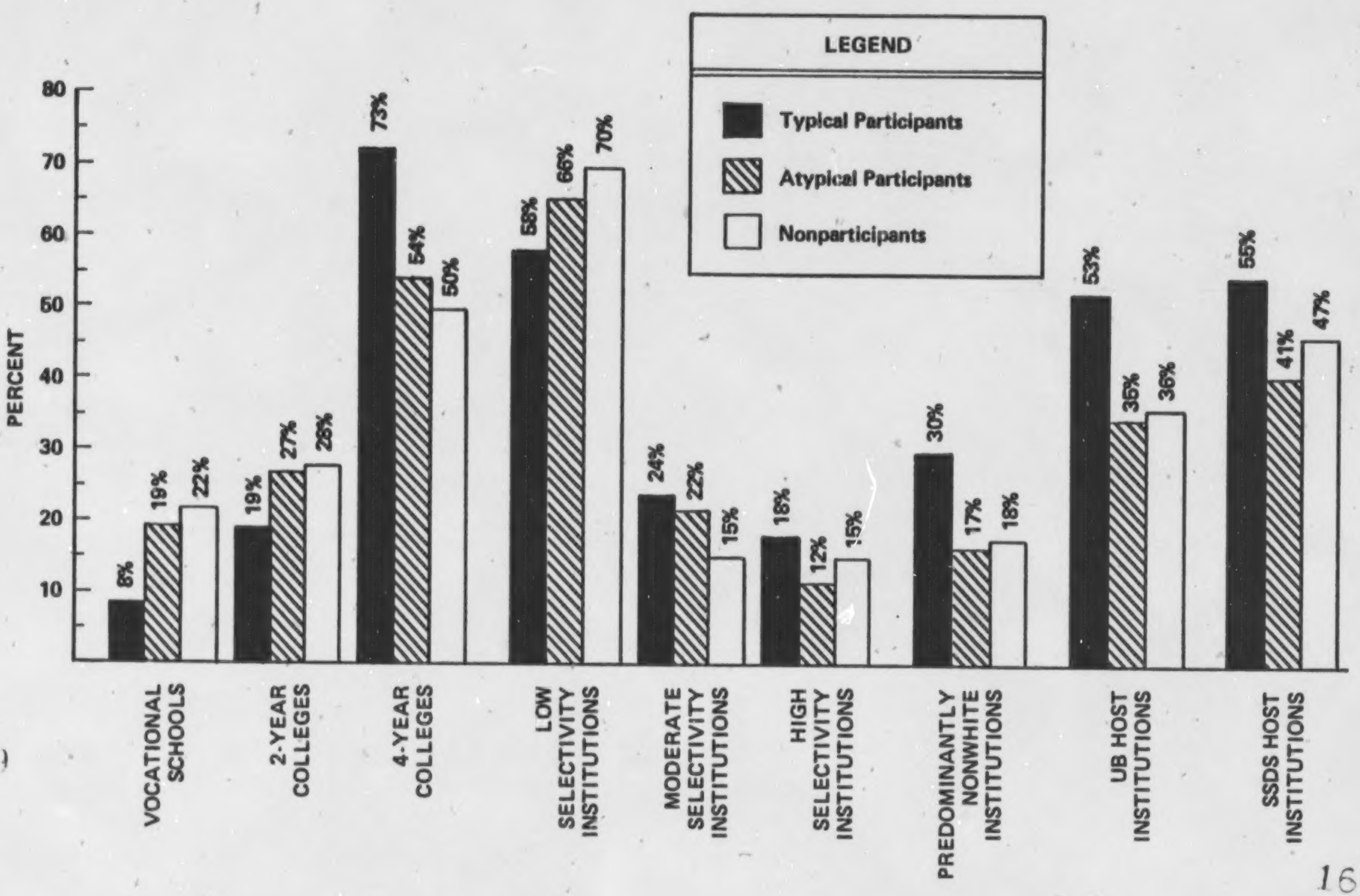

Figure 22. PSE attendance patterns as a function of Upward Bound participation pattern.

partially attributable to their greater attendance rates at UB host institutions due to the interrelationships of these institutional classifications to UB host status.

F. Use of Support Services

Former participants reported significantly greater use of available tutoring services than nonparticipants. Available counseling services were used more frequently by former participants than nonparticipants only within SSDS host institutions, and no differences were observed between the groups in use of available remedial services. The PSE outcome model suggests that the different institutional contexts within which former participants and nonparticipants operate contribute indirectly to the observed differences.

G. Student Financial Aid

Grants or scholarships are the most common form of student aid received by all participation pattern groups. Basic Educational Opportunity Grants were the most frequently reported source of aid; typical participants received BEOGs at significantly higher rates (79 percent) than atypical participants (70 percent) or nonparticipants (59 percent). Essentially the same pattern of aid receipt was observed for Supplemental Educational Opportunity Grants, although the percentages of each group receiving such grants were considerably smaller. Nonparticipants were also less likely to receive National Direct Student Loans or to participate in college-sponsored work programs than either typical participants or atypical participants. The pattern of aid receipt from three major aid categories (grants/scholarships, loans, savings/earnings) was stable within different levels of institutional offering. The structural modeling of PSE outcomes suggested that differences in grants/scholarships and use of earnings or savings resulted primarily as an indirect effect of: (a) attending different types of schools and (2) greater use of counseling services. Typical participants also generally received greater dollar amounts of aid than atypical participants who, in turn, received more aid than nonparticipants; this pattern was relatively stable across different levels of institutional offering and is primarily attributable to larger average grant amounts received by program participants.

The composition of the aid package received also differed for participants and nonparticipants; about two-thirds of the UB participants, compared to less than half of the nonparticipants, received aid packages comprised of two or more of the major aid categories (including grants in nearly every case). Typical participants received packages consisting of the three major aid categories (grants/scholarships, loans, earnings/savings) at significantly higher rates than atypical participants or nonparticipants. Such differential aid packaging was relatively stable across level of institutional offering, but varied somewhat with student class. Freshmen and sophomores report aid packages that rely more heavily on grants and scholarships, and UB participants' aid packages were more heavily weighted in this direction than nonparticipant packages. A shift is suggested in aid packaging for all three groups during the junior and senior year toward greater reliance on loans. The shift over time from grants/scholarships to loans was also indicated by the PSE outcomes model that was examined.

Former UB participants also reported more adequate total financial aid packages but the difference was only observed among those who had last attended more expensive schools. About two-thirds of the former participants and nonparticipants at low-cost schools reported adequate support from the total aid package; at high-cost schools, the percentages were 76 and 59 for former participants and nonparticipants, respectively. Regardless of school cost, however, former participants reported inadequacy of family contributions at substantially higher rates than nonparticipants, which is consistent with findings of greater problems with family or personal finances among this group.

H. PSE Success: Persistence, Progress, and Performance

Since this study, as well as the previous studies, indicated that former UB participants entering PSE differed from PSE-entering nonparticipants in several ways, it was anticipated that these analyses would be difficult to interpret. In addition, although the PSE-entering nonparticipants were statistically adjusted on various background variables (e.g., poverty status, academic risk status, minority status), they represented a self-selected group of educational "survivors." Thus, the findings pertaining to PSE progress, persistence, and performance must be interpreted cautiously.

Former participants and nonparticipants, when considered within a specific level of institutional offering, did not differ systematically on measures of PSE persistence. Full-time attendance rates differed across institutional

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level-of-offering type, but within school type rates did not differ significantly among participation pattern groups. About 70 percent of those who last attended vocational/technical schools or four-year institutions and about 50 percent of those who last attended two-year colleges were either currently enrolled or graduated. Less than 20 percent of each participation pattern group reported withdrawing without graduating and with no intent to return. UB participants attended available summer sessions at greater rates than nonparticipants, which is one indication of greater persistence; however, this difference (about 10 percentage points) may be attributable to participation in the UB summer "bridge program," which occurs during the summer following high school graduation. No significant differences in number of terms attended were suggested at either vocational/technical schools, two-year colleges, or four-year institutions, although obvious differences existed as a function of the type of school last attended. The results of PSE outcome modeling provided similar findings regarding number of terms attended but further suggested that the extent of PSE attendance for all UB participants who had entered PSE was actually greater than for nonparticipants, due primarily to indirect effects associated with greater rates of attending four-year institutions among UB participants.

Similarly, there was no suggestion of systematic differences in measures of educational performance as a function of UB participation within institutional type. No systematic differences in rates of being academically dismissed or being placed on academic probation were observed as a function of either UB participation or level of offering of school last attended. UB participants did show a lower overall grade point average (GPA) than nonparticipants at both vocational/technical schools and four-year institutions. The GPA for UB participants was about 2.0 (equivalent to a letter grade of C) at both types of schools, while the nonparticipant GPAs were higher by .6 and .2 at vocational/technical schools and four-year institutions, respectively. Comparable results regarding GPA were obtained in the modeling approach, which suggested relatively small indirect effects due to attending different types of schools, differential use of support services, or differential financial aid receipt.

The educational progress of UB participants was comparable to that of nonparticipants, when level-of-offering of school last attended was controlled. No systematic differences were observed in graduation rates among the participation pattern groups, within institutional type, but differences across level-of-offering classification were indicated: about 40 percent at vocational/technical schools, less than 10 percent at two-year colleges, and about 20 percent at four-year institutions. Four-year college rates were greater, when considering the twelfth-grade cohort, to which this outcome is most relevant, and rates at other institution types are probably artificially depressed. Rate of entry into graduate school, for those who had completed a four-year program, were comparable for participants and nonparticipants (about 10 percent). Neither the number of credits earned nor the rate of earning credits differed among participation groups, when level-of-institutional-offering was controlled. The educational pace of both groups (rate of earning credits, while enrolled) was less than what would be expected under normal progression: about 60 percent of the normal pace at two-year and four-year institutions and about 30 percent of the normal rate at vocational/technical schools. PSE outcome modeling produced comparable results for credits earned, and suggested an overall advantage of about two-thirds of a term's credits accruing to typical UB participant as a result of indirect effects, primarily through attending different types of schools.

A goal-related measure of progress of typical participants was greater than that of either atypical participants or nonparticipants. Within the twelfth-grade cohort, typical participants had progressed, on the average, over half way toward their goals, while those in the other two groups showed about 20 percent less progress. Progress toward goal was generally lower for the eleventh- and tenth-grade cohorts, but the differences between participation pattern groups remained stable. Differences in goal-related progress were primarily attributable to differential PSE entry rates and types of institution attended, since examination of differential goal-related progress between former participants and nonparticipants, within school offering category and restricted to the PSE-entering subgroup, indicated no significant differences.

I. Other Outcomes

Current employment status was a function of current enrollment in school. Among those not currently enrolled in PSE, former UB participants reported significantly higher unemployment rates (27 percent) than nonparticipants (18 percent). Of those working, comparable proportions were working full-time (about 5 to 1) as compared to part-time. Among those currently enrolled, almost half of each group was working either full- or part-time. Significantly fewer UB participants held full-time jobs, however, suggesting a

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slight advantage over nonparticipants in the need for employment to support their education.

No consistent or systematic differences were found between UB participants and nonparticipants in regard to general satisfaction. In general the lowest levels of satisfaction were experienced by individuals who entered PSE, did not graduate, and were not currently enrolled; satisfaction was highest for those who had completed PSE or were currently enrolled. The results of this analysis were considered inconclusive, principally because of the nature of the questionnaire item defining this construct.

IV. CONCLUSIONS

The results of this study, in conjunction with those of the previous studies, offer rather consistent support for the general conclusion that the UB program is effectively meeting its mandated objective to provide participants with the skills and motivation necessary for entry and success in education beyond high school. Program impact is greatest on short-term outcomes, and evidence that UB is providing the skills, motivation, and assistance necessary for entry into PSE is substantial. While it is less clear that the program also provides the skills and motivation necessary for success in PSE, there are some results to support the contention of an overall positive impact of UB participation on PSE success.

While it is impossible to state definitively that the greater aspirations, expectations, and PSE entry rates of UB participants were brought about (or caused) by their exposure to the program, this appears to be the most likely conclusion. The pattern of results obtained is closely aligned with what would be expected in view of the common areas of program emphasis and intervention strategies. Almost all projects emphasize the importance of postsecondary entry and assist participants in applying for and gaining admission to some postsecondary institution, as well as in obtaining financial aid from that institution. It would be unusual if these efforts were not reflected in greater entry rates of participants and in their securing more attractive financial aid packages during the first years of PSE. Similarly, projects uniformly provide support and counseling to participants toward increasing self-confidence in their abilities and toward raising their educational sights. With these treatments and with the advantage realized in gaining postsecondary entry, greater aspirations and expectations of former participants are also not surprising. Greater attendance by former participants in four-year institutions, UB host institutions, and SSDS host institutions are also consistent with the implicit program placement emphases. The importance of the placement function is further supported by findings that participants who were in the program during their senior year enter PSE at a greater rate than participants who were not.

There is no evidence that academic skills accrue to any greater extent by participation in UB, since no differential change in high school GPA as a function of program participation was found (base year study) and little, if any, systematic unique relationship between typical measures of PSE progress, persistence and performance and extent or pattern of UB participation is indicated (first follow-up and second follow-up studies). Given the limited instructional time available to projects, clear-cut impact on academic skills may be an unrealistic expectation. On the other hand, the results do suggest that program participants benefit from sharpened PSE coping or survival skills, such as the facility to obtain more attractive and adequate financial aid packages, and the knowledge and use of available support services. The most plausible explanation of differences in such skills is attributable to participation in the UB program.

Once PSE has been entered and the specific PSE setting has been established, there is no systematic evidence that UB participants progress, persist, or perform any better than comparable nonparticipants; however, these results may be somewhat misleading. Although data for those who entered PSE were statistically adjusted for differences between for UB participants and nonparticipants on various background variables (e.g., poverty status, academic risk status, minority status), the nonrespondents still represent a self-selected group of educational survivors who have progressed/persisted into PSE without the additional assistance and support provided to the former UB participants. Motivational factors related to this survival were not measured and the statistical adjustments certainly did not reflect such factors in any way.

On the other hand, while the legislative UB program objective clearly focuses on postsecondary success and while PSE progress, persistence, and performance are legitimate criteria for PSE success, projects are not afforded any direct strategies for intervention once a participant leaves the project to enter college. Yet, additional follow-up intervention strategies within the entered PSE institution may be required to provide a sufficient set of conditions for success in PSE. Thus, measures of postsecondary success *per se* may not be appropriate or reasonable criteria for program evaluation. In this connection, it should also be noted that the measures of PSE success employed in the study are time-bound and current estimates may not reflect the final values of these constructs for either the UB participant or nonparticipant group. In light of these limitations, the findings pertaining to PSE progress, persistence, and performance are not conclusive.

Despite these concerns and limitations, there is considerable evidence that placement of UB participants in particular PSE settings may lead indirectly to an overall advantage over PSE-entering nonparticipants. PSE placement of participants is a legitimate function of the UB program, and the differences in types of schools (level-of-offering, selectivity, etc.) attended by former participants and nonparticipants suggests that many UB participants have been channeled into educational settings and challenges that they would otherwise have bypassed. In any case, it is strongly suggested that substantial numbers of former UB participants enter PSE who would not have gone otherwise, and that a substantial percentage of these students will successfully complete a postsecondary program of study. Moreover, it is reasonable to assume that, as a result, these young people will obtain better jobs and, in general, lead more productive and satisfying lives. Viewed from this broader perspective, an impact of the UB program in terms of its ultimate purpose is certainly indicated.

Appendix A

Summary of the Base-Year Evaluation Study of the Upward Bound Program

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Summary of the Base-Year Evaluation Study of the Upward Bound Program

I. BACKGROUND AND PURPOSE

Under authority of the Economic Opportunity Act of 1964, as amended (42 U.S.C. 2809), the Office of Economic Opportunity (OEO) funded 17 Upward Bound (UB) projects as a pilot program in the summer of 1965. In 1966, UB was authorized as a national program under Title II-A of the Economic Opportunity Act. On July 1, 1979, responsibility for the program was transferred from OEO to the U.S. Office of Education (USOE), Department of Health, Education, and Welfare (HEW). Currently, UB is authorized under Section 408 of the Higher Education Act of 1965, as amended (20 U.S.C. 1068).

UB was designed to reach low-income high school students who have potential for successfully completing a postsecondary education program but who, due to inadequate preparation or lack of motivation, are prevented from seeking higher education or from meeting conventional criteria for admission to a college, university, or technical institute. Through the use of remedial instruction, exposure to new or altered curricula, tutoring, cultural enrichment, and counseling, the program is designed to generate in such individuals the skills and motivation necessary to enter and successfully complete postsecondary education.

During the summer, UB students typically reside on a college, university, or secondary school campus for an intensive six to eight week session, taking courses, attending cultural and social events, and receiving counseling. In the academic year, they typically receive less intensive attention: they may attend Saturday classes, attend periodic tutorial/counseling sessions, or participate in occasional cultural enrichment activities. During their junior and senior years of high school, they receive guidance in exploring options for postsecondary preparation and the program best suited to their needs.

In July 1973, USOE awarded the Research Triangle Institute (RTI) a contract (OEC-0-73-7052) to plan and conduct an evaluation of the UB and Talent Search (TS) programs. Several sources were consulted in designing the study, including the enabling legislation, the official guidelines, selected program personnel, current and former UB staff personnel and students, and three study advisory panels. The planning study was conducted from July 1973 to January 1974; the actual studies were implemented and conducted from February 1974 to March 1976.

The primary goal of the RTI study was to evaluate two of the program's major objectives: (1) to increase the high school retention rate of its participants and (2) to increase the rate of entry of its participants into postsecondary institutions. Evaluation of the legislatively mandated objective--attainment of skills and motivation necessary for postsecondary success--was a secondary goal of the study, primarily because of practical problems involved in determining and measuring the nature and degree of such skills and motivation. Another secondary study goal was to provide a detailed national description of the UB program, including characteristics of the staff and students, their perceptions of the program, and project operations and costs. A final study goal was to examine project characteristics in relation to attainment of program objectives.

II. METHODOLOGY

The study utilized a quasi-experimental design in which a sample of UB students and comparison students were followed through a short period of time. The design was basically cross-sectional, with the collection of some retrospective and short-range longitudinal data.

Multi-stage probability sampling techniques were employed. Of the UB projects operating in the United States during the 1973-74 program year, 54 were selected after stratification on student ethnicity, number of students served, project location, project emphasis, and type of host institution. All participants in the sampled project who were in grades 10, 11, or 12 were selected, yielding 3,710 UB students in the final sample. The comparison population was defined as students in the same grade levels and high schools as the UB students. For each selected UB project, an average of two high schools providing students to that project were selected. From sampled classrooms in each of these schools, a total of 2,340 comparison students (about 21 per sampled school) were selected after stratification on grade level, ethnicity, low income status, and academic risk. The final sample of UB project staff included project directors from all 54 selected projects and a sample of 104 counselors and 211 instructors. Also, 15 of the 54 sampled UB projects were selected for site visitation.

Data were collected through questionnaire responses, interview responses, and student records. Very low return rates were experienced with only one student questionnaire which was directed to dropouts who were difficult to locate and probably less motivated to respond. In total, over 98 percent of students in both the UB and comparison groups responded to at least one questionnaire. The minimum return rate for staff questionnaires was 73 percent for UB instructors. Complete staff data (i.e., questionnaires returned by all sampled staff in a project) were available for only one-third of the projects sampled, but in about 70 percent of the projects, questionnaires were available from the project director and from at least half of the sampled counselors and instructors. In all, the extent of indeterminate data for returned questionnaires had no serious impact on the analysis.

For analyses, sampling weights were used where feasible in computing the various statistics as unbiased estimates of population parameters. Weight adjustments were made for both item and instrument nonresponse. To evaluate the attainment of basic UB objectives, a series of analyses focused on comparative student outcomes of UB participants and comparison students. Differences between these populations on such factors as grade level, sex, race, academic risk, poverty status, and general region, state, district, or school-specific educational environments were reduced by the sample design or by *a posteriori* statistical adjustment of the comparison group's indices.

III. SUMMARY AND INTERPRETATION OF MAJOR FINDINGS

A. Attainment of Basic UB Objectives

1. Increasing the Rate of High School Completion

Fall-to-spring high school continuance rate within each of grade levels 10, 11, and 12 is slightly higher for the UB group than for the comparison group--significantly so for grades 10 and 11. Regardless of grade level considered, however, these continuance rates for both groups were quite high, ranging from 93 to 98 percent. Within the UB group, fall-to-spring continuance rates for twelfth graders tended to increase with the length of time students had spent in the UB program. Fall-to-fall high school continuance rates are lower for both groups, ranging from 85 to 93 percent. The only statistically significant fall-to-fall rate difference was for grade 10, in which the UB students showed higher rates (93 percent versus 86 percent). Further, these rates do not appear to be related to the extent of UB participation. These analyses do not indicate that the UB program is significantly increasing high school completion among its participants. For UB and similar students, the estimated probability of completion of any given high school grade is high (85 percent or above); the estimated probability of completing the twelfth grade, for a student who enters the tenth grade, is about 70 percent, regardless of UB participation.

2. Increasing the Rate of Entry into Postsecondary Education (PSE)

Among high school graduates, 47 percent of the comparison students entered PSE as compared to 81 percent of the UB participants. Among all individuals who could have entered PSE (i.e., those not still in high school, including dropouts), 65 percent of UB students entered PSE as compared to 43 percent of comparison students. There is also evidence that among high school graduates, PSE entry rate is positively related to length of participation in the UB program. That is, 78 percent of the students who had participated in UB in grades 10 through 12 entered PSE, 69 percent of the students who had participated in UB in grades 11 and 12 entered PSE, and 68 percent of the students who had participated in UB only in grade 12 entered PSE. Of those UB students entering PSE institutions, about 75 percent enrolled in four-year colleges or universities, about 10 percent entered two-year junior or community colleges, and the remaining students entered vocational, trade, or other schools; comparable figures for the comparison group were about 45, 30, and 25 percent, respectively.

Given these results, it appears that UB participation is positively related to immediate entry into PSE. A plausible explanation for this relationship (though not the only one) is that UB program participation raises the probability of student entry into PSE.

3. Generating Skills and Motivation Necessary for Success in Education Beyond High School

Analyses indicated the UB program helps students in preparation for PSE, including the applications process. The data further indicated that proportionally more UB than comparison students apply for financial aid. Although UB aid applicants do not receive more offers of aid, they do receive more adequate offers, generally in the form of larger grants. There was no apparent relationship between UB participation and changes in academic measures from ninth grade to current grade in terms of grade point average, proportion of academic credits taken, and academic credits passed. There is evidence, however, that greater proportions of UB participants planned and expected to attend and complete PSE. These results suggest that the UB program is providing supportive, advocacy, and advisory services that facilitate entrance to PSE.

4. Student Evaluations of UB Projects

Students involved in the UB projects appear positive about the staff and their program experience. The quality of the curriculum, of counseling, and tutoring, and of overall administration is perceived to be quite high, as is the pattern of staff and student interrelationships. The self-reports of the students strongly suggest that they are incorporating program objectives into their own behavior, self-concept, and aspirations. The average ratings of academic year program elements were slightly lower than those of comparable elements in the summer program. Students perceived the UB program's central functions and such day-to-day operations of teaching, counseling, and administration to be well conducted and organized. They considered the best qualities of the program to be the staff's interest in the students and the harmonious relationships among the staff and the students. They also prized highly the staff's willingness to accept student suggestions. Of the potential benefits attainable from UB participation, students rated gaining a better understanding of the need for education and being prepared to gain admission to enter college or other types of schools as being most important. At the same time, not all students find all project activities helpful.

B. Characteristics of UB Projects, Staff, and Students

A major finding, supported by the site visits and the analyses of questionnaire responses, is that UB does not appear to represent a single intervention, or even two or three clearly delineated interventions. Variation, rather than commonality, was the salient aspect of program description for most of the dimensions considered. Within the general limits established by program guidelines, projects varied extensively in the kinds of students served and the ways in which specific intervention strategies were implemented. Pursuit of the general program objectives appeared to be common across projects, but particular objectives and emphases given them showed considerable variation among projects.

1. Project Costs

In the program year from 1 July 1973 to 30 June 1974, 416 UB projects reported serving 51,755 clients at a cost of $38.3 million. Of the 416 projects, 67 served approximately 12,200 veterans and 9 special demonstration projects served approximately 980 students. The estimated average yearly total cost per project (excluding in-kind contributions) was $111,986 for the 1973-74 program. For the 1973 summer program, the estimated cost was $63,769 per project or approximately $830 per student served; for the 1973-74 academic year program, the estimated average cost was $51,863 or approximately $700 per student served. Over 90 percent of these monies were contributed by federal sources. There was considerable variation in the cost figures reported for projects. The range of reported total costs, excluding in-kind contributions, was from $9,792 to $175,000 during the summer program and from $19,500 to $134,000 during the academic year. Nonfederal support ranged from $0 to well over $100,000, with the preponderance of projects reporting no nonfederal funding. Projects reported receiving an average of $9,149 worth of in-kind contributions, such as office space, facilities, and personnel services, although these estimates are suspected to be low.

Examinations of project costs and project characteristics indicated the number of students served was positively related to total project costs. These results are not surprising as project funding is determined by a formula which accounts for the number of students to be served. No factors were observed that would suggest institutional or urban-rural inequities in funding.

2. Project Activities and Services

A wide range of courses and classes, tutoring and counseling services, sports, social and cultural activities, and medical and dental services were offered by projects during both the summer and academic year programs. Tutoring and counseling services were generally offered by all projects during both sessions, but there was greater variability in the availability of other activities. A greater variety of courses seemed to be available during the summer program than during the academic year. The activities most commonly available were also characterized by the highest participation rates among those students for whom the activities had been available, and these activities were considered to be the most helpful among the students who had participated. Although the overall program exhibits considerable variability--particularly in the academic year component--UB seems to be providing and delivering the basic activities required by the guidelines.

3. Relations with Host Institutions and Other Supporting Groups

UB staff reported receiving at least moderately effective support from their host institutions, their advisory committees, and other parent and community groups. The staff and students reported good relationships among themselves, suggesting that in most projects the directors, staff, and students formed a highly cohesive group. Almost all of the project directors rated their host institutions (primarily public and private colleges and universities) as being supportive. Evidence of host institution support and commitment to specified projects, and to the UB concept in general, was also obtained in site visits. Directors reported cooperative relationships with other programs for the disadvantaged which operated in their areas (both those adminstered by the same host institution and those administered by other institutions). UB instructors and counselors also reported receiving a high degree of cooperation from high schools and PSE institutions. Such cooperation is important since UB projects typically depend on high schools for recruiting students, providing school records, and developing complementary programs of study for students. Additionally the projects depend on PSE institutions for processing applications, granting admission, administering financial aid, and providing for the needs of students in the institutions. Many project directors interviewed during site visits felt the need for more assistance, monitoring, feedback, and direction than they were currently receiving from the central and regional offices of USOE. A common concern across projects and regions was the timing of notification of funding and consequent late funding.

4. Project Staff

On the average, the projects were staffed by one and one-half full-time equivalent (FTE) administrative employees and three FTE support staff during both the academic year and summer programs. The major staffing difference between the two program components was for instructors and counselors, with an average of 4.3 of these service delivery employees during the academic year and 11.5 during the summer program. There was considerable variation about these average staffing profiles, but no significant associations were found to exist between project staffing patterns and other project characteristics.

Most staff members were young (age 35 or less). Nearly all project directors, and over half of the instructors and counselors, were male. The greatest proportion of project directors were Black, while the greatest proportion of instructors and counselors were white. Projects appeared to employ staff of the same ethnicity as the student participants, though not always in the same proportions. Most of the staff had obtained at least a bachelor's degree, with slightly more than half having obtained a degree at the master's level or higher. In general, the course work and training completed by the UB project staff appeared directly related to their job needs. Over a third of the staff reported current participation in continuing education, and over half had attended workshops on teaching, counseling, or program administration for disadvantaged students. In addition to formal training and education, UB project staff generally had considerable practical experience in their field of work, but less experience working specifically with disadvantaged students.

All staff members, including project directors, performed a number of activities in common, principally, teaching and counseling. Most staff members appeared to be carrying reasonable work loads, and to be directing their energies efficiently. Instruction tended to be oriented toward group discussion or individualized instruction, and competition was deemphasized.

There was an extremely high degree of agreement in the ratings of education goals by project directors, counselors, and instructors. In general, the staff agreed that the more important goals of education were developing student enthusiasm for learning, helping students to feel important, and providing students with a solid grasp of fundamental skills. Instructors rated the following behaviors to be most important in their teaching: encouraging students to become involved, giving students praise and affection, answering student questions, encouraging students to make choices, and diagnosing individual learning problems.

5. Recruitment and Characteristics of Students

UB students most frequently reported first hearing about the program from other UB students. Other sources from which substantial proportions of students first heard of the program were school guidance counselors, UB staff members, and school teachers. These results support observations that formal student recruitment was carried out in most projects by "contact counselors" in the feeder high schools. Responsibility for the final selection of students, using various criteria but generally considering factors such as family income, grades and aptitude test scores, teacher and counselor recommedations, evidences of student motivation, and personal intuition, was assumed by UB project directors and staff.

About 51 percent of the UB students were Black; 18 percent were white; and 20 percent either American Indians, Mexican Americans, Puerto Ricans, or Orientals. Approximately 56 percent of UB students were female. Approximately 85 percent of the students were 16 to 18 years of age; and approximately 15, 39, and 45 percent were in grades 10, 11, and 12, respectively. Based on ninth grade academic information which was typically prior to UB participation, slightly more than half of the UB students were classified as "academic risks." On an index that is closely related but not identical to federal poverty-level guidelines, approximately two-thirds of the UB students were considered to be at or below poverty level. About one-half the parents of UB students had attained a formal education equivalent to or greater than a high school diploma. UB students were seen by directors, instructors, and counselors as most proficient in peer relations and creativity. General academic ability of students was rated to be above average by all staff. The lowest ratings were given to student attitudes toward authority and toward school, self-concept, and attention span.

Although most UB students appeared to be the kind for whom the program is intended, the definition of the target group with regard to potential for academic achievement appeared to vary because of lack of specificity, operational feasibility, or differences in interpretation among staff in various projects. Some of the resulting differences in the UB participants among projects may represent a desirable heterogeneity, but this heterogeneity appears to result from variability in personal convictions or preferences of project staff or from lack of precision in definitions specified in the legislation and guidelines. This is not to state that ineligible or undeserving students are being served, but that a variety of kinds of disadvantagement are probably now represented in different projects.

C. The Relationships of Student Outcomes to Project Characteristics

The relationships of project characteristics with average student outcomes for the project sites were analyzed. Poverty status, grade-point average in the ninth grade, academic risk, sex, and similar pre-UB measures of student characteristics had strong relationships with outcome measures such as PSE entry rates, changes in grade-point averages, and types of PSE entered. Relationships between outcome measures and UB staff characteristics, types of instruction, counseling, and tutoring were examined, after adjustments for pre-UB measures and some weak relationships were found. The basic finding suggests that projects with lower proportions of academic risk and/or poverty level students are more likely to achieve the basic goal of inducing or experiencing high PSE entry rates. This relationship does not provide particularly useful information for program-level decision making, since any project can determine, through selection procedures, the academic and economic nature of participants (within the constraints of the program guidelines).

Generally, the analyses did not discover any systematic set of UB project characteristics related to success. A possible explanation of this pattern of findings, which is supported by observations during site visits, is that different approaches are used by UB projects because different types of students are selected, and that different students are selected because a UB project has geared its approach to that particular type of student. With this explanation, statistical adjustments for input differences, such as those used in these analyses, would tend to cancel any effects due to a UB process. This explanation is quite consistent with the study findings, but to investigate the hypothesis more fully would require different approaches to both design and measurement than those employed in this study.

Appendix B

Summary of the First Follow-up Evaluation Study of the Upward Bound Program

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Summary of the First Follow-up Evaluation Study of the Upward Bound Program

I. BACKGROUND AND PURPOSE

Under authority of the Economic Opportunity Act of 1964, as amended (42 U.S.C. 2809), the Office of Economic Opportunity (OEO) funded 17 Upward Bound (UB) projects as a pilot program in the summer of 1965. In 1966, UB was authorized as a national program under Title II.A of the Economic Opportunity Act. On July 1, 1969, the UB program was transferred from OEO to the U.S. Office of Education (USOE), Department of Health, Education, and Welfare. The present legislative authority is the Education Amendments of 1976 (Public Law 94-482).

The program was designed to reach low-income high school students who have potential for successfully completing an educational program, but who, due to inadequate preparation and/or lack of motivation, are prevented from meeting conventional criteria for admission to a postsecondary program. Through the use of various intervention strategies (e.g., remedial instruction, exposure to new or altered curricula, tutoring, cultural enrichment activities, counseling, and encouragement) the program is legislatively mandated to generate in participants the skills and motivation necessary to enter and successfully complete postsecondary education (PSE).

During the summer, UB participants typically reside on a postsecondary campus for an intensive six- to eight-week session of courses, cultural and social events, and counseling. In the academic year, they typically receive less intensive attention (e.g., Saturday classes; periodic counseling). During their junior and senior years of high school, participants receive guidance in exploring options for postsecondary preparation.

In July 1973, USOE contracted with the Research Triangle Institute (RTI) to plan and conduct an evaluation of the UB program. The initial (base-year) study (ED 131-152 and 131-153) provided a comprehensive description of the UB program as it existed in program year 1973-74, investigated the relationships of UB participation to short-term educational outcomes, and examined the relative effectiveness of different types of UB projects in respect to these short-range outcomes; however, the base-year study provided no information regarding postsecondary progress and persistence.

The follow-up study reported herein was conducted between October 1976 and September 1977 to obtain information about intermediate educational outcomes, particularly as related to the postsecondary experience. One major focus of the follow-up study was educational progress and persistence as related to extent of prior participation in the UB program, but the study also allowed investigation of student educational expectations, problems experienced in obtaining an education, and other outcomes. Another major purpose was to examine the unique relationships between certain educational outcomes and student characteristics, temporal factors, and contextual factors, in addition to extent of UB participation, to gain a fuller understanding of potential program effectiveness. The study also provided a vehicle through which the results of the base-year study could be reevaluated.

II. DESIGN AND METHODOLOGY

The design of the follow-up study was necessarily constrained by the design of the preceding base-year study. From the 333 regular UB projects operating in the coterminous United States during the 1973-74 program year, 54 were selected after stratification on student ethnicity, number of students served, project location, type of project, and type of host institution. All participants in the sampled projects who were in grades 10, 11, or 12 were selected, yielding 3,710 UB participants in the final sample. An average of two high schools providing students to each selected UB project were selected, and, from a sample of classrooms in each of these schools, a total of 2,340 nonparticipating comparison students were selected after stratification on grade level, ethnicity, low-income status, and academic risk.

Follow-up data were collected during the winter and early spring of 1977 from members of the base-year study sample, through a mail survey and through telephone interviews of a subsample of nonrespondents to the mailing. Other data were obtained from existing sources: the base-year student master file, a postsecondary institutional data file, and USOE records. Overall response rate for the study was 71 percent; however, sample coverage was considerably higher (95 percent). The extent of indeterminate data was small; inconsistency within the data was generally within reasonable tolerance levels; and data reliability was generally acceptable.

Two conceptually different, but related, approaches to analysis were undertaken. The first approach was comparative-descriptive and addressed questions of national program impact by comparing UB participant outcomes with outcomes for a statistically equated group of nonparticipants. The second approach was relational; multiple regression was employed to predict educational outcomes on the basis of individual background factors, temporal and contextual factors, extent of program participation, and the various interactions of these factors. Sample weights were used in analysis, where appropriate and feasible, to account for unequal selection probabilities, and weight adjustment procedures were implemented so that nonrespondents would be represented in the final results by respondents who were most like them. Appropriate standard errors were computed for all comparative-descriptive results and, when feasible, for the relational results.

III. OVERVIEW OF MAJOR FINDINGS

The current findings and findings from the base-year are quite consistent in suggesting UB program impact on those outcomes where it would be most expected--educational expectations, progress, and persistence. Moreover, in respect to progress and persistence, the suggested program impact seems to be focused at the transition step between high school completion and postsecondary entry. There is no defensible indication of program effect on high school completion or on progress and persistence once postsecondary entry has been gained.

Although the increments in educational outcomes as a function of program participation appear to be of sufficient magnitude to offset some of the decrements associated with being over age-in-grade, poverty level, academic risk, or ethnic minority, these increments are not sufficient to offset all such decrements.

The suggested program impact is also typically incremental--greater impact with greater exposure to the program. The most clear-cut incremental relationship is associated with educational expectations, for which each added year of program exposure provides a well-defined increase in expectations. For the progress and persistence measures, however, suggested incremental impact appears to be an all-or-none function, with little or no increase as a result of one year's participation and with a more-or-less equivalent increase attributable to either two- or three-years' participation. This relationship of extent of program participation to educational progress and persistence is also seen to be focused in the area of postsecondary entry.

Difference in the patterns of educational progress for UB participants and nonparticipants is presented in Figure 1. The values given in that figure are composites from the tenth- and twelfth-grade cohort results and include: (1) conditional rates of advancing to a subsequent educational level, given attainment of a previous level (in parentheses) and (2) percentages of the original groups attaining each educational level (in brackets). The figure shows clearly that the greater overall progress of former program participants is primarily attributable to the greater rates at which they enter PSE.

The postsecondary entry rates should be considered, however, in light of differences in the types of institutions entered and the types of individuals who enter. Former program participants enter four-year institutions, institutions with more attractive financial aid policies, and institutions hosting UB projects in greater relative numbers than nonparticipant comparisons. Among the postsecondary-entering subgroup of nonparticipants, males, poverty status individuals, ethnic minorities, and academic risks are underrepresented. Such underrepresentation was not observed among former UB participants, suggesting that the program may be assisting participants in overcoming some long-standing barriers to PSE.

The specific examination of progress and persistence following PSE entry showed no advantage for former participants but was basically inconclusive. The results involve progress and persistence measures after a maximum of only three and one-half years following high school completion. It is unrealistic to expect that these measures are not deeply confounded with the individual's pace of educational advancement. Among the population of nontraditional students being considered, temporary interruptions in educational progress and

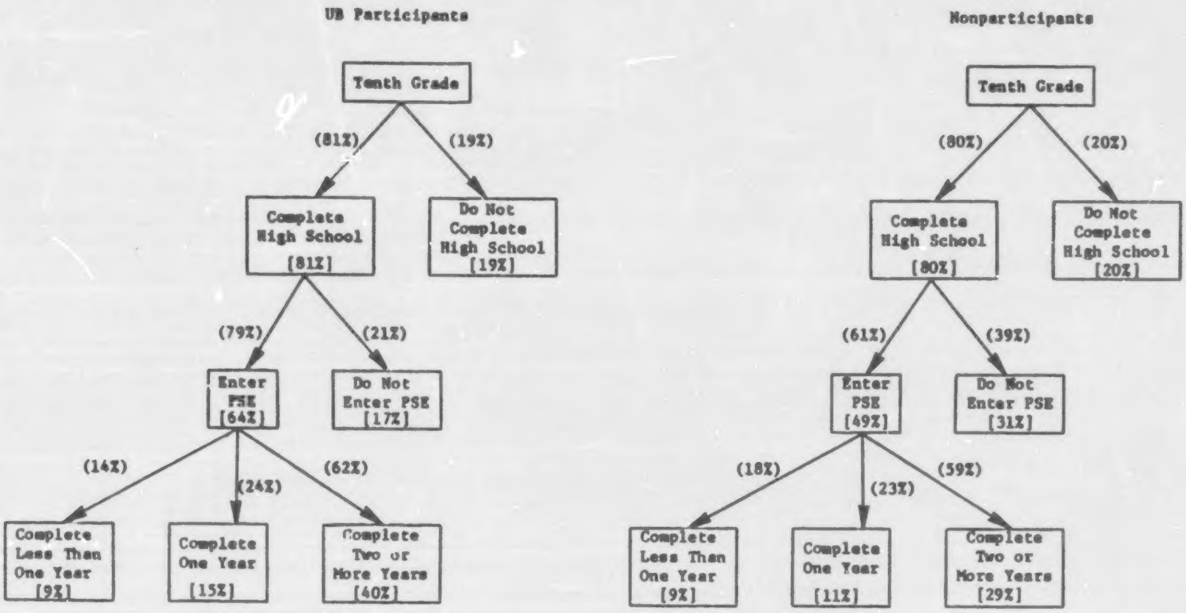
UB Participants
Tenth Grade
(81%)
(19%)
Complete High School [81%]
Do Not Complete High School [19%]
(79%)
(21%)
Enter PSE [64%]
Do Not Enter PSE [17%]
(14%)
(24%)
(62%)
Complete Less Than One Year [9%]
Complete One Year [15%]
Complete Two or More Years [40%]
Nonparticipants
Tenth Grade
(80%)
(20%)
Complete High School [80%]
Do Not Complete High School [20%]
(61%)
(39%)
Enter PSE [49%]
Do Not Enter PSE [31%]
(18%)
(23%)
(59%)
Complete Less Than One Year [9%]
Complete One Year [11%]
Complete Two or More Years [29%]

Figure 1. Composite of educational progress of Upward Bound participants and nonparticipants

persistence toward ultimate educational goals are to be expected. While no general impact of UB program participation on postsecondary success was suggested by the current results, this in no way suggests that impact would not be indicated by more long-term measures.

While it is impossible to state definitively that the greater expectations, progress, and persistence of former UB participants were brought about (or caused) by their exposure to the program, such a conclusion appears to be the most likely one. The pattern of results are closely alligned with what one might expect as a result of the common areas of project emphases and strategies, and the incremental nature of the outcomes for different lengths of program exposure is also quite intuitive in light of program operations.

Virtually all projects emphasize the importance of postsecondary entry and assist participants in applying for and gaining both admission to some postsecondary institution and financial aid from that institution. It would be surprising if these efforts were not reflected in greater entry rates of participants. One would also expect greater attendance by former participants in four-year institutions, UB host institutions, and institutions with attractive aid policies, given the implicit program placement emphases. The importance of the placement function of the program is further supported by findings that participants who were in the program during their senior year (the time during which postsecondary application and admission is most heavily stressed) enter postsecondary education at a greater rate than participants who were not.

Similarly, projects uniformly provide support and counseling to participants toward increasing self-confidence in their abilities and toward raising their educational sights. With these treatments and with the advantage realized in gaining postsecondary entry, the greater expectations of former participants are also not surprising.

There are, nonetheless, alternate plausible explanations for the findings, the most likely of which is that program participants initially enter the program partly because of their existing aspiration for education beyond high school. This possibility could not be investigated directly, since no measure of pre-program motivation was available; however, the base-year findings indicated that many projects selected participants, in part, on the basis of their expressed desire to enter PSE.

Whatever impact the UB program may have on the outcomes of participants, it appeared to be pervasive and egalitarian. There was no indication of differential project effectiveness on any of the outcome measures considered. Both of the major analyses suggested that any benefits derived from the program by participants were more-or-less the same regardless of the individual's sex, race, poverty status, or risk status.

IV. SUMMARY AND INTERPRETATION OF SPECIFIC FINDINGS

A. Educational Expectations

A greater percentage of former participants (55 percent) expected to complete at least a four-year college education than did nonparticipants (40 percent), and expectations were generally higher given longer participation in the UB program. This finding is similar to the results of the base-year study; however, while the current expectations of nonparticipants were slightly less than those reported during the base-year, the current expectations of participants were slightly higher. It was further suggested that a single year of program participation was associated with a significant increase in expectations that was sufficient to compensate for the decrease associated with being either poverty-level or over age-in-grade. The increase in expectations associated with three years of program participation effectively compensated for the combined decrease associated with being an academic risk and within poverty level.

B. Educational Problems Experienced

Greater proportions of former UB participants than nonparticipants reported having experienced problems in educational progress due to poor high school preparation, family finances, and inadequate financial aid. This finding is not particularly surprising when one considers that former participants have higher educational expectations, that they generally attend different kinds of postsecondary institutions, and that they may have been sensitized to these problems through UB program counseling.

C. High School Completion

In general, former UB participants, demonstrated no greater high school completion rates than nonparticipants. These results were in basic agreement with results of the base-year study. Secondary completion rates were high for both participants and nonparticipants, and the rates were greater for those in the higher grades initially, as might be expected. High school completion rates for UB participants were 81 percent, 91 percent, and 96 percent for the tenth-, eleventh-, and twelfth-grade cohorts, respectively. Analogous rates for nonparticipants were 80 percent, 86 percent, and 96 percent.

D. Postsecondary Entry Rates

Within each of the three grade cohorts, the overall PSE entry rate for former UB participants was greater, by almost 20 percentage points, than that for nonparticipants. Among nonparticipants who had completed high school, entry rates were 49 percent, 58 percent, and 61 percent for the tenth- through twelfth-grade cohorts, respectively. Analogous rates for former UB participants were 68 percent, 73 percent, and 79 percent. An examination of the incidence of delayed PSE entry indicated that substantial percentages of those individuals who had not entered postsecondary education during the base-year subsequently entered after a delay. Such delayed entry was greater for former participants (62 percent) than for nonparticipants (36 percent).

Also, within each of the three grade cohorts, longer participation in the UB program was associated with greater PSE entry rates. For the total participant group, PSE entry rates were 63 percent, 75 percent, and 82 percent, respectively, for those with one-, two-, or three-years' participation in the program. One year of program participation provided a negligible increase in PSE entry rate, but two or more years of program participation was associated with a significant increase in the likelihood of entry. Three years' exposure to the program compensated for the combined decrease in likelihood of postsecondary entry associated with being an academic risk and being one year over age-in-grade.

E. Types of Individuals Entering Postsecondary Education

Among UB participants, the proportions of ethnic minorities, males, poverty status individuals, and academic risks in the postsecondary-entering subgroup coincided with the analogous proportions in the total participant population. Among the PSE-entering subgroup of nonparticipants, however, all of these groups were underrepresented. This suggests that PSE entry is more egalitarian among former program participants than nonparticipants.

F. Types of Postsecondary Institutions Entered

A greater percentage of former UB participants (66 percent) reported attending four-year institutions or universities than did nonparticipants

(51 percent). Former participants also reported greater attendance at institutions hosting an Upward Bound project (47 percent) than nonparticipants (23 percent). Attendance at Special Services for Disadvantaged Students (SSDS) host institutions was slightly, but not significantly, greater among former participants, and UB participants attended institutions with more attractive financial aid policies at somewhat greater rates than nonparticipants. The finding regarding institutional level of offering is directionally consistent with results of the base-year study.

The considerably greater rate at which former participants attended UB host institutions cannot be explained by attendance proximity since the nonparticipant sample was drawn from the same locations as the participant sample. Host institutions are committed to the program and to serving its participants, and this finding indicates that enrollment of former participants in host institutions is disproportionately large relative both to the nonparticipant enrollment and to the proportion of host institutions in the institution population. It is suspected that at least part of this difference is attributable to the fact that a fairly large number of UB participants are admitted to the particular institution that served as host for the specific UB project in which they participated.

G. Postsecondary Persistence and Progress

Investigations related to this topic were restricted to the subsets of former UB participants and nonparticipants who entered some form of postsecondary schooling, and, from the findings already noted, it is obvious that these investigations could not have provided completely clear-cut results. The former participants entering PSE differed from entering nonparticipants, their educational expectations were greater, they entered different kinds of postsecondary institutions, and they reported having experienced more problems in fulfilling their educational aspirations.

No consistent or systematic difference was detected between former UB participants and nonparticipants in respect to postsecondary progress, and no differences were observed as a function of length of program participation. The one hint of a relationship between program participation and progress was for the eleventh-grade cohort, in which former participants held a marginally significant advantage.

Differences were observed in the current enrollment rates of former participants and nonparticipants; nonparticipants who had entered PSE were currently enrolled at somewhat higher rates (76 percent) than were former participants (67 percent), but no differences in current enrollment were observed as a function of length of program participation. This finding for the aggregate group was primarily attributable to the difference observed within the twelfth-grade cohort. In general, current enrollment rates for both participants and nonparticipants tended to decrease from the tenth- to the twelfth-grade cohort.

These findings indicate that while former UB program participants have progressed as far in postsecondary education as nonparticipants they are currently enrolled in smaller relative numbers. The fact that participants demonstrated slightly greater progress than nonparticipants in the eleventh-grade cohort and lower current enrollment than nonparticipants in the twelfth-grade cohort suggests that postsecondary attrition among former participants is greater than that of nonparticipants following the second year of PSE but that through the second year participants are progressing as well or better than nonparticipants.

No systematic or meaningful differences in educational progress as a function of institution type or of perceived adequacy of financial aid were uncovered; however, the disparity between current enrollment of former participants and nonparticipants was concentrated within the universities, two-year schools, UB host institutions, and SSDS host institutions, as well as among the subgroup of individuals reporting problems with adequacy of financial aid. These differential disparities suggest a complex pattern that resists an immediate or simple explanation, particularly in light of other findings.

H. Overall Educational Progress

A seprate examination of this more general progress measure indicated that the overall educational progress of former UB participants is greater than that of the nonparticipants and is greater with longer participation in the program. This finding held within each of the three grade cohorts considered. The increase in educational progress associated with one year of program participation was not significant, and the increase associated with two years' participation was only slightly less than that associated with three years' participation; either increase was sufficient to compensate almost completely for the decrease associated with being an academic risk. The basic nature of the difference in overall educational progress of UB participants and nonparticipants has been presented in Figure 1.

I. Additional Findings

One of the most surprising findings was that the relationships between educational expectations and progress and the variables used to predict them were quite stable regardless of the specific project site involved or the specific characteristics of the sample member. A particularly relevant implication from this finding is that any suggested impact on these intermediate educational outcomes attributable to UB participation is effectively the same for blacks, whites, or other ethnic groups; for males or females; for poverty level and nonpoverty individuals; and for academic risks as well as nonrisks.

The lack of an interactive relationship between project association and extent of participation in the program is of particular importance since it implies that differential project effectiveness can be discounted in explaining variation in the outcome measures selected. That is, when student characteristics, temporal factors, contextual factors, and length of program participation are accounted for, only negligible differences remain between projects in the selected outcome measures. This finding supports the results of the base-year study, which indicated that projects do differ in types of operation and types of students but that when one controls for student input characteristics, differences in outcomes among the various projects are negligible.

Appendix C

Sampling Methodology

Appendix C

Sampling Methodology

I. SAMPLING OVERVIEW

A major purpose of the national evaluation study was to estimate the effect of the Upward Bound (UB) program on the educational continuance rates of the high school students it serves.[1] In order to estimate this effect, it was necessary to have some standard against which to compare the continuance rates of the UB participants. The study was, therefore, also concerned with measuring continuance rates among nonparticipating students (comparison students) who were similar enough to the UB participants to provide meaningful benchmarks against which the rates of participants could be compared. The study measured the rates for (1) UB participants who were high school sophomores, juniors, or seniors at the beginning of the 1973-74 school year and (2) comparison students in the same grades at that time.

In developing a sample design, concern was given to selecting a sample that would yield estimates of sufficient precision (i.e., estimates having a small enough sampling error to be useful) and to producing these estimates at the least cost. For the UB evaluation study, a two-stage sample design was planned. The first stage involved the selection of a sample of UB projects, the second stage involved the selection of a sample of tenth-, eleventh-, and twelfth-grade students who were participating in those UB projects selected in the first stage.

Since the purpose of the study necessitated the estimation of educational continuation rates not only for UB participants but also for a comparison group of similar nonparticipants, a comparison population was also defined and sampled. It was decided that a group satisfying the requirements of similarity and comparability to the UB students was the population of nonparticipating students attending the same schools as the UB students (hereafter referred to as feeder schools). This definition of a comparison group had both analytical and administrative advantages.[2] The definition had one obvious disadvantage; to the extent that UB activity in a school had beneficially affected students who otherwise were not associated with the UB program, the study results would be biased in the direction of underestimating the beneficial effect of the UB program on educational continuance rates.[3] All things considered, however, the accepted definition was judged to be the most desirable of the feasible alternatives.

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[1] It should be kept in mind that the UB program was evaluated after it had been operational for a number of years and that the evaluation procedures available at such a stage do not provide the precise answers that would be forthcoming from an experimental design.

[2] By using as control students those who attended the same schools as UB students, control for differential school effects is obtained. This can be expected to have the effect of increasing the precision of estimates of differences between UB students and control students. In addition, using such schools provides a geographic clustering of the UB and comparison student samples and an associated reduction in cost.

Sample optimization procedures suggested that 54 UB projects would be selected for the sample. For each sample project, all high school students in grades 10, 11, and 12 who participated in that project during September or October 1973 were included in the sample. In addition, two feeder schools were selected for each sample project and, from each feeder school, seven or eight comparison students were taken from each of grades 10, 11, and 12. To further reduce the amount of field work involved in the sampling procedures, it was decided to sample comparison students within the selected schools in two stages, by first selecting a sample of classes and then selecting a sample of students within these classes. A graphic representation of student sampling, showing the different stages of selection, is presented in Figure C.1. A more detailed description of the selection of the 54 sample projects and of the subsequent stages in the selection of the student samples is presented below in Section II.

Other samples were drawn in the base-year study, namely: samples of project and high school staff and a subsample of projects for site visits. These sampling procedures are not discussed here since they do not pertain to either of the follow-up studies. The interested reader is referred to Appendix B of the base-year study[4] for details regarding these additional samples.

Student subsampling procedures were implemented in the base-year study and in the two follow-up studies. These subsamplings were were typically pertinent only to those who did not respond to mail surveys and involved selecting a subsample of nonrespondents for telephone tracing and interview (to provide adequate sampling coverage). These procedures are described in greater detail in Subsection II.B.3 for the base-year study and in Sections III and IV for the first and second follow-up studies, respectively.

II. SPECIFIC SAMPLING PROCEDURES FOR BASE-YEAR STUDY[5]

A. The UB Project Sample

RTI obtained from the U.S. Office of Education (USOE) and from the 10 USOE Regional offices copies of the project proposals for all regular[6] UB

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[3] Another disadvantage associated with this group of comparison students is that they were expected to differ from UB students on important background characteristics. This expectation did obtain (see, for example, Table H.1 of Appendix H); however, statistical adjustments for such differences were possible (see Appendixes G, H and I).

[4] Burkheimer, G. J., Levinsohn, J. R., Koo, H. P., and French, A. M. Evaluation Study of the Upward Bound Program (Volume IV of A Study of the National Upward Bound and Talent Search Programs. Four Volumes). Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, April 1976. (ED 131-153)

[5] For a more detailed discussion of the sampling techniques described in this appendix, see Kish, L., Survey Sampling, New York: John Wiley & Sons, 1965.

[6] Special projects for veterans and demonstration projects were excluded.

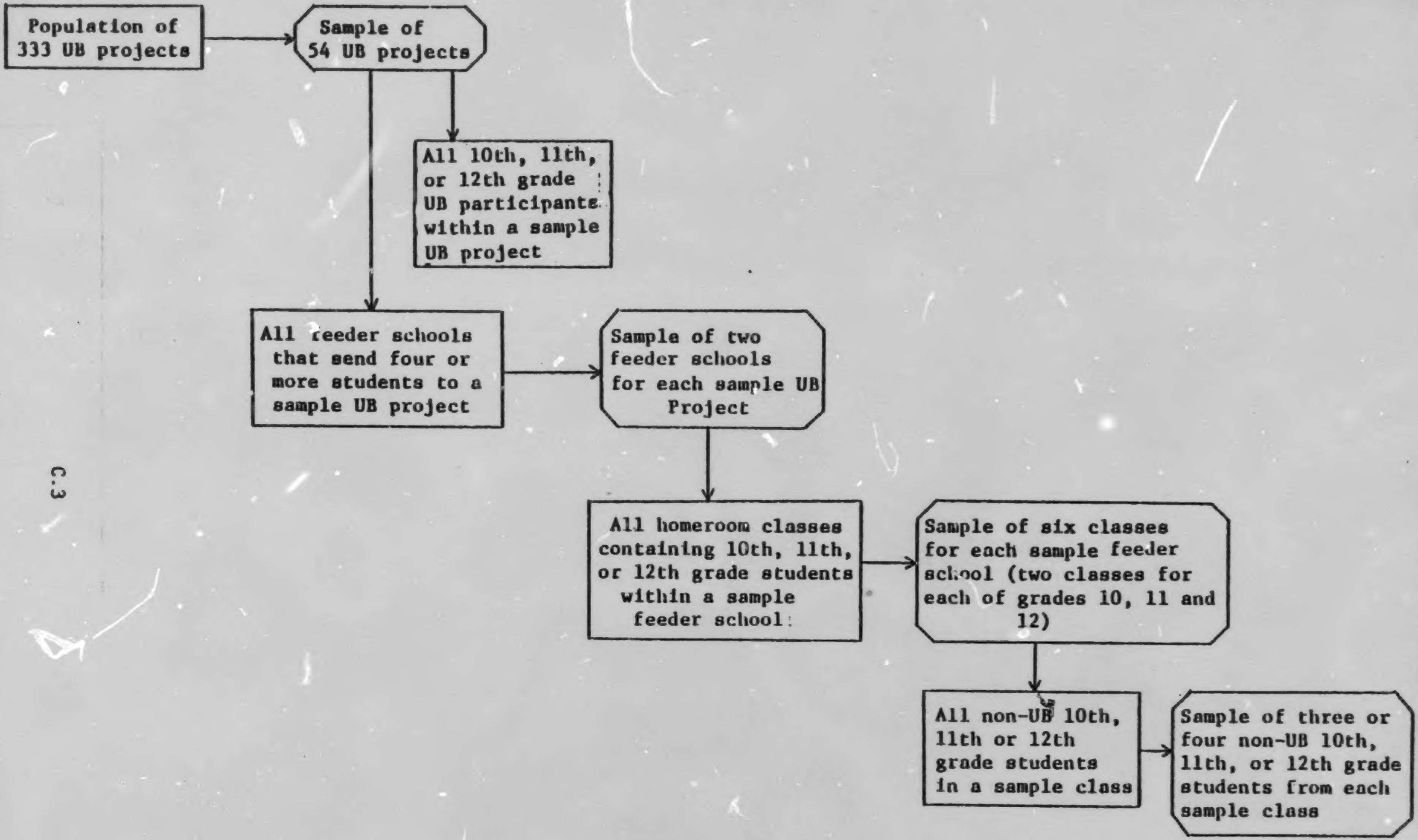
Population of 333 UB projects
Sample of 54 UB projects
All 10th, 11th, or 12th grade UB participants within a sample UB project
All feeder schools that send four or more students to a sample UB project
Sample of two feeder schools for each sample UB Project
All homeroom classes containing 10th, 11th, or 12th grade students within a sample feeder school
Sample of six classes for each sample feeder school (two classes for each of grades 10, 11 and 12)
All non-UB 10th, 11th or 12th grade students in a sample class
Sample of three or four non-UB 10th, 11th, or 12th grade students from each sample class

Figure C.1. Structure of the UB Student and Comparison Student Samples.

projects that were funded for fiscal year 1973-74. From these proposals characteristics of the funded projects were obtained, and a frame from which projects would be sampled was constructed. To have been included in the project sampling frame, a project must have possessed all of the following characteristics:

1) The project was funded for fiscal year 1973.

2) The project proposed to serve students in grades 10, 11, and/or 12.

3) The project was located in coterminous United States.

The 333 projects possessing all of the above characteristics constituted the frame from which sample projects were selected. Using project characteristics obtained from the project proposals, the 333 projects were partitioned into 27 strata on the basis of 6 variables. These variables, together with their category levels, are listed below:

1) Ethnic background of participants, with six levels:[7] (a) Black, (b) Black and White, (c) 10+ percent American Indian, (d) 10+ percent Mexican American, (3) 10+ percent Puerto Rican, and (f) all other.

2) Office of Education geographic region, with 10 levels: (regions 1 through 10).

3) Program emphasis, with four levels: (a) academic orientation, (b) personal development orientation, (c) combination of academic and personal development orientation, and (d) other.

4) Project age, with four levels: (a) new this year, (b) 1 year old, (c) 2 years old, and (d) 3 or more years old.

5) Location of participants, with seven levels: (a) citywide, (b) selected parts of a city, (c) rural, (d) city and rural, (e) statewide, (f) reservation, and (g) regional.

6) Type of sponsoring institution or agency, with nine levels: (a) secondary school, (b) two-year college, (c) four-year college, (d) vocational-technical school, (e) private, nonprofit agency, (f) consortium of educational institutions, (g) agency for a consortium, (h) proprietary school, and (i) public agency.

The strata were constructed so as to have approximately equal total numbers of participants in grades 10, 11, and 12. From each of the 27 approximately equal-size strata, two different projects were selected for the sample

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[7] Ethnic composition code, based on racial distribution of proposed participants for project year 1973-74. Black: All or mostly black, i.e., no other race $\geqq$ 10 percent. Black and White: Black $\geqq$ 10 percent and White $\geqq$ 10 percent and no other race $\geqq$ 10 percent. American Indian: American Indian $\geqq$ 10 percent. Mexican American: Mexican American $\geqq$ 10 percent and American Indian $\leqq$ 10 percent. Puerto Rican: Puerto Rican $\geqq$ 10 percent and American Indian $\leqq$ 10 percent and Mexican American $\leqq$ 10 percent. Other: All other.

Table C.1

DESCRIPTION OF THE 27 STRATA FOR SELECTING PROJECTS

Stratum Number	Characteristics of Projects in Stratum					
	Ethnic Composition[a]	Region	Program Emphasis	Project Age	Location of Participants	Sponsor
1	Black	5	All	All	All	All
2	Black	3	All	All	All	All
3	Black	1,2	All	All	All	All
	Black	4,6	All	Under 2 years	All	All
4	Black	4,6	All	2 years	All	All
5	Black	4,6	All	3+ years	All	All
6	Black & White	3	Academic	All	All	All
7	Black & White	4	Academic	3+ years	Not all city	4-year college
8	Black & White	6	Academic	All	All	All
	Black & White	4	Academic	Under 3 years	All	All
	Black & White	4	Academic	3+ years	City	All
	Black & White	4	Academic	3+ years	Not all city	Other than 4-year college
9	Black & White	3,4,6	Personal Development	All	All	All
10	Black & White	3,4,6	Combination	3+ years	All	All
11	Black & White	3,4,6	Combination	Under 3 years	All	All
12	Black & White	5	All	All	Not regional	All
13	Black & White	1,2,7	All	All	All	All
		5	All	All	Regional	All
14	10%+ American Indian	All	All	All	Reservation	All
15	10%+ American Indian	8,9,10	Academic	All	Non-Reservation	All
16	10%+ American Indian	1,2,3,4,5,6,7	Academic Skills	All	Non-Reservation	All

(continued)

Table C.1 (continued)

Stratum Number	Characteristics of Projects in Stratum					
	Ethnic Composition[a]	Region	Program Emphasis	Project Age	Location of Participants	Sponsor
17	10%+ American Indian	All	Other than academic skills only	Under 3 years	Non-Reservation	All
18	10%+ American Indian	5,7,8, 9,10	Other than academic skills only	3+ years	Non-Reservation	All
19	10%+ American Indian	1,2,3, 4,6	Other than academic skills only	3+ years	Non-Reservation	All
20	10%+ Mexican American	3,4,6	All	All	City or city parts	All
21	10%+ Mexican American	3,4,6	All	All	Not all city	All
22	10%+ Mexican, American	1,2,5, 7,8,9, 10	Academic skills	All	All	All
23	10%+ Mexican American	1,2,5, 7,8,9, 10	Other than academic skills only	All	All	All
24	10%+ Puerto Rican	All	All	All	Not all city	All
25	10%+ Puerto Rican	All	All	3+ years	City or city parts	All
26	10%+ Puerto Rican	All	All	Under 3 years	City or city parts	All
27	Other	All	All	All	All	All

[a] Ethnic composition code, based on racial distribution of proposed participants for project year 1973-74
Black: All or mostly Black, i.e., no other race ≧ 10%.
Black & White: Black ≧ 10% and White ≧ 10% and no other race ≧ 10%.
American Indian: American Indian ≧ 10%.
Mexican American: Mexican American ≧ 10% and American Indian ≦ 10%.
Puerto Rican: Puerto Rican ≧ 10% and American Indian ≦ 10% and Mexican American ≦ 10%.
Other: All other.

with probability proportional to a measure of size, which reflected the total number of participants in grades 10, 11, and 12.[8] This resulted in the selection of 54 different UB projects.

A description of the 27 strata that were formed is provided in Table C.1. As evident from the descriptions of the 27 strata, not all variables were used in defining each separate stratum. Stratum number 1, for example, consists of all projects in which the ethnic composition of the clients was coded as "Black" and which are located in USOE geographic region number 5. The "all" listed in Table C.1 for the last four columns of stratum number 1 indicates that these variables were not used in classifying projects into this stratum, i.e., any level of these variables was permissible.

It may be useful to consider the stratification and selection of the 54 sample projects in more detail. Stratification may be defined as the division of a population into subparts, called strata, for the purpose of sampling separately from each stratum. Although there are a number of reasons for stratifying prior to the selection of the sample, the 27 strata were formed for the selection of 54 sample Upward Bound projects for two basic reasons: (1) to insure against underrepresentation of certain minority groups (e.g., American Indian, Mexican American, and Puerto Rican) in the sample; and (2) to attempt to reduce the size of sampling errors that otherwise would result if a sample of 54 projects were selected without stratification.

In forming the 27 strata, the aim was to make the projects within each stratum as similar as possible on the variables of central interest in the study (e.g., educational continuance rate for UB participants) and to make the 27 strata as different from one another as possible on these variables. To the extent that this is done successfully, the sampling errors will be decreased, as compared to those based on an unstratified design. Ideally one would form strata on the basis of the important outcome variables of the study, but, because such information is generally not available, the strata are usually formed on the basis of available characteristics thought to be correlated with the outcome variables. To the extent that stratifying on these related characteristics actually does form strata that are homogeneous with respect to the outcome variables under study, the sampling errors of the estimates of these variables will be reduced.

The stratification variables used in dividing the 333 projects into 27 strata were those thought to be related to educational continuance: ethnic background, geographic region, UB project program-emphasis, project age, location of participants, and project sponsor. If all of these six variables were cross-classified with one another, there would be some 108,000 cells. Since there were only 333 projects, most of the cells would have been empty and many would have contained only one or two projects. It is obvious that combining or collapsing of cells was necessary. In attempting to combine cells to form homogeneous groups, some "miscellaneous" strata resulted (e.g., stratum number 8--see Table C.1). In addition, the combination process resulted in certain categorizations being used for some groups and not for others. For example, city versus noncity was a meaningful and useful way to divide projects having a sizeable number of Puerto Ricans, but was not useful in dividing projects classified as American Indian; for this latter group, a reservation versus nonreservation distinction was made.

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[8] The procedure used is described in detail in M. R. Samford, On sampling without replacement with unequal probabilities of selection, Biometrika, 54, 4, 1967, pp. 499-512.

In forming the homogeneous strata, an attempt was made to form the strata so that they were as nearly equal in size as possible (i.e., equal with respect to the number of UB participants anticipated for the school year 1973-74). This was done because using equal size strata generally can be expected to bring about greater gains in precision of estimates relating to student characteristics than using strata that vary greatly in size. This set of 27 strata, of course, is only one set from among the many possible sets of 27 strata that could have been formed. It is entirely possible that another set would have been better (i.e., would have yielded estimates having a somewhat smaller sampling error than estimates from a sample based on the 27 strata that were actually used). Undoubtedly many other sets would have been worse. Different ways of forming 27 strata can affect the size of the sampling errors of the estimates, but would not affect the unbiased nature of the estimates made from study data. Unbiased estimates of population characteristics are possible regardless of the effectiveness of the stratification.

Once the 27 strata were formed, 54 projects were randomly selected without replacement, two from each stratum, using probabilities proportional to a measure of project size. This procedure was used in order to allow the desired control over the number of UB participants selected from each project while permitting an overall similar probability of selection of UB participants. By selecting two projects from each stratum it is possible to make unbiased estimates of between-strata and within-strata components of variance, permitting estimation of the extent of reduction in sampling error that was brought about due to stratification of projects prior to selection.

The distributions of UB projects, both nationally and for the sample, in terms of the stratification variables are given in Table C.2. Because the projects were selected with other than equal probabilities, an unweighted distribution of sample projects would not necessarily be similar to the distribution of the population of 333 projects, except on those variables used for stratification. With one exception, the percentage distributions presented in Table C.2 show that the unweighted distributions of the 54 sample projects on the six variables involved in the stratification process were quite similar to the distributions based on the 333 projects in the population. The major distributional difference, as would be expected, was in respect to the variable "expected number of students in project." This difference was largely due to the fact that projects were selected into the sample with probabilities proportional to measures of project size, which gave projects having over 100 anticipated participants a greater chance of selection than projects having 100 or fewer anticipated participants.

B. The Student Samples

1. The UB Student Sample

Within each of the 54 sample projects, all students who were in grades 10 through 12 and who were UB participants in September or October of 1973 were selected into the sample. This selection was based on the most

Table C.2

POPULATION AND SAMPLE DISTRIBUTIONS OF UB PROJECTS BY ETHNIC COMPOSITION, REGION, PROJECT PROGRAM EMPHASIS, PROJECT AGE, LOCATION, SPONSOR, AND SIZE OF PROJECT

a. Ethnic Composition

Ethnic Composition	Population	Sample	
	Percent	Percent	Number of Projects
1. Black	18	19	10
2. Black and White	33	31	17
3. Indian	20	20	11
4. Mexican	17	15	8
5. Puerto Rican	9	11	6
6. Other	3	4	2
Total	100	100	54

b. Region

Region	Population	Sample	
	Percent	Percent	Number of Projects
1	8	9	5
2	9	9	5
3	12	9	5
4	22	26	14
5	13	15	8
6	13	11	6
7	7	4	2
8	5	6	3
9	8	7	4
10	4	4	2
Total	100	100	54

(continued)

Table C.2 (continued)

c. Project Program Emphasis

Program Emphasis	Population	Sample	
	Percent	Percent	Number of Projects
Academic Skills	52	48	26
Personal Development	13	11	6
Combination	30	37	20
Other	1	0	0
Not Applicable (new project)	4	4	2
Total	100	100	54

d. Project Age

Project Age	Population	Sample	
	Percent	Percent	Number of Projects
New	14	7	4
1 Year	10	11	6
2 Years	12	13	7
3 Years	60	65	35
Not Applicable	4	4	2
Total	100	100	54

(continued)

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Table C.2 (continued)

e. Location

Location	Population	Sample	
	Percent	Percent	Number of Projects
City	14	11	6
City Parts	16	17	9
Rural	9	9	5
City Rural	49	52	28
Statewide	2	2	1
Reservation	3	4	2
Regional	6	6	3
Other	1	0	0
Total	100	100	54

f. Sponsor

Type of Institution	Population	Sample	
	Percent	Percent	Number of Projects
Secondary School	2	0	0
Two-Year College	8	11	6
Four-Year College	84	85	46
Vocational/Technical School	2	0	0
Private Non-Profit	1	2	1
Combination	3	2	1
Agency	0	0	0
Proprietary School	0	0	0
Public Agency	0	0	0
Total	100	100	54

(continued)

Table C.2 (continued)

g. Project Size

Expected Number of Students in Project	Population	Sample	
	Percent	Percent	Number of Projects
0-50	19	13	7
51-75	40	35	19
76-100	23	19	10
101-125	11	13	7
126-150	4	9	5
151-175	1	7	4
176-200	1	4	2
201+	1	0	0
Total	100	100	54

current CUB[9] roster, as updated by the directors of selected projects, and resulted in the selection of 3,710 eligible UB students associated with the 54 sample UB projects.

2. The Comparison Student Sample

Comparison students were selected from "feeder" high schools associated with the 54 sample projects. To adequately describe the comparison student sample, it is necessary to first define the feeder school sampling procedure.

A feeder school was defined as a school with at least four tenth-, eleventh-, and/or twelfth-grade students listed on the most recent CUB roster as being clients of a given UB project, or as a school from which a newly funded UB project planned to serve at least four tenth-, eleventh-, and/or twelfth-grade students during the 1973-74 school year. For sampling purposes, each feeder school was associated with one, and only one, UB project. If a feeder school provided students to more than one project, it was associated only with that project to which it provided the greatest number of students. In order to accomplish this procedure of uniquely associating a feeder school with one and only one UB project, the CUB roster which listed the schools attended by UB students was checked for all 333 projects in the defined population.

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[9] The Current Upward Bound Student Roster as of August 1973, produced through the UB data bank.

Once the feeder schools for a sample project had been identified, they were ordered according to the number of UB students participating in the associated UB project who attended the school. The estimated total number of students in grades 10 through 12 was then recorded for each feeder school and these numbers accumulated. A systematic random selection of four feeder schools was made from the ordered list with probability proportional to size, and an equal probability subselection of two of the four schools (designated "sample" schools) was made. The remaining two schools were designated as "backup" schools to be used only if the "sample" schools refused to participate in the study. For some projects, additional feeder schools were selected. This was done to keep the comparison student weights from being excessively large.

A total of 113 school selections were made, bringing into the sample 108 different schools.[10] Of the 108 sample schools selected, 5 refused to participate. Four "backup" schools (one of which was a backup for two refusals) were selected as replacements, which brought the total to 107 schools that were expected to participate. The late refusal of one school resulted in a final sample of 106 schools providing the sample comparison students that were used in the study.

Within each sample feeder school, six homeroom classes (two per grade) of students in grades 10 through 12 were selected with equal probability from class lists supplied by the sample schools. For each selected class, a list of students who were in the class during September 1973 was obtained. For each student listed, the homeroom teacher was asked to indicate the student's grade level and ethnic background, to estimate whether or not the student came from a low income family, and to indicate whether or not the student should be considered as an "academic risk" for a two- or four-year college education. This information was used to stratify students prior to selection.[11] The student lists for the sample classes were carefully checked against the September 1973 list of UB students, and the students who were listed as being associated with a UB project were removed from the student class lists. From these corrected lists, a stratified random sample of comparison students was then selected, with an expected 21 students from each sample control school (42 if the school had been selected twice), yielding a total of 2,340 eligible comparison students.

The selection of the students within a school involved a predetermined set of procedures. First, using the information provided by the homeroom teacher, the students were stratified according to their grade in school and according to whether or not they appeared to meet the eligibility requirements of the UB program. Then, a random sample of students was selected from each stratum, with the objective of selecting approximately equal numbers of students from each of the three grades and of over-sampling students who appeared to be like UB students.[12] Of the students thus selected into the sample, some were tentatively classified as "like UB" and some as "unlike UB" students, but a disproportionately high number of "like UB" students were selected. This was done in order to attempt to include a substantial number of students who were, in fact, eligible for a UB program.[13]

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[10] The selection procedures permitted a school to be selected more than once, and in five instances a school was selected twice. In such cases, the number of sample students to be selected from the school was doubled.

[11] Rather than sending class lists, several sample schools sent complete rosters of all of their students who had been enrolled in September 1973. In such cases a sample of 20 students from each grade level was selected, and the lists of selected students were then sent back to the school with the request that the school provide information on the background characteristics of each student listed. Such completed lists were then treated as though they were class lists, for the purposes of selecting the sample comparison students for the study.

The specific procedures used in selecting the sample of comparison students involved the formation of three strata within each of the three grades. Stratum I included all students classified by the school as coming from a low income family and also classified by the school as an "academic risk." Stratum II contained all other students classified as low income. Stratum III included all the remaining students. An adjusted measure of size was calculated by multiplying the actual number of students in Stratum I by 4, the actual number of students in Stratum II by 2, and the actual number of students in Stratum III by 1. Thus, "low-income-high-academic-risk" students were selected at approximately four times the base rate and other low income students were selected at approximately twice the base rate. This measure of size adjustment was employed to increase the probability of selecting students who appeared to be like UB students. The measures of size were then totaled for the selected classes within each grade. The sample of approximately seven students[14] selected from each grade was allocated to each of the three student strata in proportion to the measures of size calculated above with one constraint: at least three students were selected from Stratum I, if the stratum contained at least three. This departure from the strict proportional allocation insures that about half the comparison sample students selected would be those thought to be "like" UB students.[15]

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[12] In the analysis of the student data, the characteristics of comparison students were, of course, determined from different factual information rather than the teachers' estimates used in the sample selection procedures.

[13] The samples of UB and comparison students were designed and selected in such a way as to maximize the precision of estimates of the UB population and of the comparison student population (i.e., the population of non-UB students attending feeder schools associated with the 333 UB projects). In addition, the design attempted to permit efficient comparisons of the two groups of students. The comparison group was expected to differ from UB students on some relevant background characteristics; however, statistical adjustments were planned and implemented in all studies to reduce or eliminate the effects of these dissimilarities. The oversampling of comparison students who were thought to be like UB students aimed at increasing the precision of the comparisons between UB students and the adjusted comparison student population.

[14] In four schools, 14 students were selected from each grade. In one school, 10 students were selected from each grade.

[15] When a large proportion of one of the minority groups, i.e., Mexican American, Puerto Rican, or American Indian, was included in Stratum III, these students were placed in a separate stratum. The measure of size assigned this special stratum equaled the number of students in that stratum. The sample of seven students was then selected in proportion to the measures of size of the four strata. This extra stratification was done to increase the number of such minority students selected.

At each stage of the sample selection, each unit in the defined population was given a positive chance of being selected. These probabilities were recorded and combined into an overall probability of selection for each UB participant and nonparticipant, thus permitting the computation of unbiased estimates of population characteristics for UB as well as comparison students. To produce these unbiased estimates, each sample student was assigned a weight equal to the inverse of the probability of his being selected. Thus, students selected with smaller probabilities received larger weights. The weighting procedure used at the estimation stage therefore compensates for the use of unequal probabilities at the selection stage.

3. Special Base Year Subsampling Procedures for UB and Comparison Students Not Responding to the Fall (1974) Status Questionnaire

Mail returns of a Fall Status Questionnaire (FSQ), a fall 1974 follow-up instrument, fell far below expectations. The low response rate caused more than the usual amount of concern because it was felt that whether or not the sample member responded might well be highly related to whether or not the person was still enrolled in school. It was reasoned that a UB or comparison student who had dropped out of school would be more likely to have left home and less likely to have received and responded to the mailed FSQ. If such were the case, the school continuance rate among the nonrespondents could be far less than the continuance rate among respondents to the FSQ, and thus results based only on the approximately 50 percent who responded could well have been spurious.

Additional steps were taken in an attempt to obtain fall status information from those UB and comparison students who did not respond to the FSQ. A telephone-tracing procedure was employed wherein these nonrespondents were telephoned, and the desired information obtained by means of a telephone interview. If the sample member could not be contacted, the desired information was sought from other knowledgeable individuals such as parents, project directors, and school personnel.

Although it would have been preferable to contact all FSQ nonrespondents by telephone, cost considerations made this prohibitive. Instead, a sampling plan was instituted. The groups of greater concern were those sample members from whom no response to any previous questionnaire had been obtained. All such individuals (exclusive of refusals)[16] were subselected with certainty into the telephone-tracing subsample. Of the remaining nonrespondents to the FSQ, all of whom had responded to a previous questionnaire, approximately 40 percent were randomly selected for inclusion in the telephone-tracing subsample. Compensation of sample weights for this subselection procedure was made prior to estimation.

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[16] Any individuals who at any stage had refused to cooperate in the study were considered refusals for the remainder of the study, and were not contacted again.

III. SPECIFIC SAMPLING PROCEDURES FOR THE FIRST FOLLOW-UP STUDY[17]

The first follow-up study involved the same basic sample of students selected for the base-year survey, with certain ineligible sample members removed.[18] Sampling in the follow-up study was confined to selecting a subsample of nonrespondents to the follow-up questionnaire mail survey. The purpose and basic procedure for this subsampling was analogous to the similar subsampling in the base-year study (Subsection II.B.3 of this Appendix). Specifically, mail return rates had not been expected to exceed 50 percent, and subsampling of the group of mail nonrespondents (who were expected to differ in important ways from respondents) for telephone follow-up was planned to ensure adequate coverage of the sample. The number of nonrespondents to be selected was contractually set at 2,500, which at the time of contract negotiations was expected to represent over half of the nonrespondent group.

The cutoff date for mail returns was set for 10 March 1977, at which time returns had been received from 1,862[19] of the 5,986 individuals who were eligible for the survey. Of the remaining 4,124 individuals, 953 questionnaires had been returned by the U.S. Mail Services as "undeliverable" and 3,171 had not been returned. RTI had anticipated these two categories of individuals (i.e., undeliverables and nonrespondents) and had planned to treat them as separate strata for purposes of subsampling. Moreover, there were several other possible strata for consideration in the subsampling. Of specific concern were the strata of the original sampling (participant or nonparticipant, original grade cohort, and UB project association), certain background factors (race, sex, poverty status, and academic risk status), and availability of previous data (particularly data from the fall 1974 collection effort). The last category was considered important in that some planned analyses were to be conditional on an individual's status in fall 1974, and collection of current data from individuals for whom no fall 1974 data were available would not facilitate those analyses.

Decisions regarding sampling rates were made jointly by RTI study staff and USOE representatives from the Office of Planning, Budgeting, and Evaluation (OPBE)[20] and the Division of Student Services and Veteran Programs (DSSVP). The decisions were based on mail returns and classifications as to "undeliverable" or "nonrespondent" status as of 24 February (at which time questionnaires had been returned by only 1,103 individuals). Analysis of response patterns indicated very little differential response of individuals in terms of the original sampling categories or student background factors (noted above); therefore, it was decided to exclude these factors from consideration in formal stratification. As a result, the formal stratifying factors were reduced to nonresponse status (undeliverable or nonrespondent) and availability of fall 1974 data. Nonrespondents and those with available fall 1974 data were to be oversampled. The reasons for such oversampling were cost related; undeliverables were seen as more difficult to trace (and thus more costly), and it was seen as cost inefficient to collect current data from those without fall 1974 data.

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[17] See also Appendix A of Burkheimer, G. J., French, A. M., Levinsohn, J. R., and Riccobono, J. A. Evaluation Study of the Upward Bound Program: A First Follow-up. (RTI Report on Project 22U-889). Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, September 1977.

[18] Sixty-four individuals of the original sample of 6,050 were declared ineligible for the survey due to various reasons--41 of these ineligibles were former UB participants and 23 were from the comparison group.

[19] Two of these returns had indicated that the sample member was deceased.

[20] This office has been reorganized into the Office of Evaluation and Dissemination (OED).

The number of individuals classified into each of the four major strata, the number selected from each stratum, and the selection rate for each stratum at time of sampling are given in Table C.3. The sampling rates are quite disparate among strata, reflecting decisions of overselection, and these disproportionate selection probabilities serve to decrease precision or increase the standard errors of estimates from resulting data. On the other hand, given a fixed budget for contacting the selected individuals and the relative ease with which nonrespondents could be contacted, more extensive efforts could be expended in attempts to contact those undeliverables selected. This was expected to result in a greater rate of contact and a subsequent reduction in standard errors. Under certain between- and within-strata variance assumptions and assuming contact rates of 70 percent and 40 percent for the nonrespondents and undeliverables, respectively, it was estimated that standard errors would be increased by a factor of 1.31. Since the actual contact rates considerably exceeded the assumed rates (rates for strata 1 through 4 were 93.7 percent, 96.4 percent, 56.9 percent, and 75.0 percent, respectively), the figure given may be taken as an upper bound on the decrease in precision as a result of disproportionate subsampling.

Table C.3

STRATA SIZES, CASES SELECTED, AND SAMPLING RATES
FOR FOLLOWUP STUDY SUBSAMPLING OF INDIVIDUALS
NOT RETURNING QUESTIONNAIRE BY MAIL

Strata	Total Number of Cases	Number of Cases Selected	Sampling Rate
(1) Nonrespondents with available fall 1974 data	2,415	2,100	87.0%
(2) Nonrespondents without available fall 1974 data	756	250	33.1%
(3) Undeliverables with available fall 1974 data	771	130	16.9%
(4) Undeliverables without available fall 1974 data	182	20	11.0%

Although the four strata previously defined were the only formal strata used in this subsampling, the other factors discussed above (e.g., base-year sampling factors and student background variables) were taken into account indirectly. The procedure used for sampling was a form of systematic random selection, in which the additional factors serve, in effect, as quasi strata. Specifically, within each of the four major strata, individuals were ordered on the basis of (1) former UB participation, (2) initial grade cohort, (3) an index reflecting sex, race, poverty status, and academic risk status, and (4) original project association. Within these ordered lists, selection was accomplished by: determining an interval, i, where i = total number of nonrespondents in the stratum divided by the number to be selected within strata; randomly selecting a number, k, between 1 and i; and selecting individual k and each ith individual following k on the ordered list. In this procedure, the ordering of the list stochastically ensures representation within the quasi strata.

IV. SAMPLING PROCEDURES FOR THE SECOND FOLLOW-UP STUDY[21]

The second follow-up study is a continuation of a data collection effort on the sample of 6,050 UB and comparison students who were selected for participation in the base-year survey. Of those students selected for the base-year study, 114 had been classified as ineligible at the conclusion of the first follow-up study due to their inappropriate definition in the initial sampling frame, death, or prior refusal.[22] A Newsletter mailing was made to the 5,936 remaining sample members in April 1978 in an attempt to obtain more current directory information. Telephone tracing activities were implemented for all cases in which the Newsletter was returned by the postal service as undeliverable. These activities uncovered 11 additional sample members who were deceased or incapacitated.

From October 1978 through January 1979, RTI conducted a mail survey of 5,874 sample members.[23] As a result of tracing activities and student-supplied directory information changes, the available directory information was relatively current at that time. Nonetheless, 357 cases were classified as undeliverable at the conclusion of the mail survey. This number included 53 cases for whom addresses had never been obtained, 255 cases classified as "hard core" undeliverables for whom extensive previous tracing activities had been unsuccessful, and 49 cases who had been successfully traced previously. Through a joint decision by RTI and USOE, it was determined that the first two groups would be excluded from further consideration.[24] From the remaining 2,614 nonrespondents and undeliverables, RTI selected a probability subsample of 1,500 students for telephone tracing and interview. In conducting the telephone interviews, a completion rate of approximately 84 percent was realized. This provided a total of 4,264 completed questionnaires for an overall response rate of 73 percent and a sample coverage of 88 percent.[25]

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[21] See also Weber, J. and Folsom, R. E. *Sample Design and Sampling Procedures for Selecting a Sample of Nonrespondents to the Student Mailing in the Second Follow-up Evaluation of the Upward Bound Program*. (Report RTI/1605/04-02S). Research Triangle Park, N.C.: Research Triangle Institute, April 1979.

[22] See Appendix E, Burkheimer, G. J., *et al.*, 1977 (*op. cit.*).

[23] Addresses had never been obtained for 53 members of the original sample.

The purpose of sampling in the second follow-up study was, thus, quite similar to that used for telephone follow-up interviewing during the base-year and first follow-up studies (Subsection II.B.3 and Section III of this appendix).

A. Target Population

The target population for the second follow-up is the same population defined for the base-year study; specifically, tenth-, eleventh-, and twelfth-grade UB students enrolled in 333 regular UB projects operating in the coterminous United States during the 1973-74 program year and eligible tenth-, eleventh-, and twelfth-grade comparison students in high schools associated with the 333 UB projects. Although the sample design and sampling procedures described in this section refer specifically to the 2,614 nonrespondents and undeliverables to the second follow-up questionnaire, all results generated from data collected in this study refer to the original base-year target population.

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[24] The 53 base year members for whom no addresses were available were never mailed questionnaires, and, with no former address as a starting point, tracing would have been extremely difficult and probably ineffective. RTI had previously spent much time and effort in the attempt to obtain current addresses for the 255 "hard-core" undeliverables without success. Based on this previous experience, it was felt that attempts to obtain completed questionnaires from this group by telephone would be very expensive and insufficiently successful to warrant that expense. Consequently, the decision was made by the USOE technical project officer, at RTI's recommendation, to exclude these cases from the sampling frame. Although weight adjustment techniques were applied to these cases to partially compensate for their exclusion from the sampling frame (see Appendix G), the exclusion of both the 255 "hard-core" and 53 "ultra hard-core" undeliverables introduces a bias into any estimates calculated from the survey results. However, had a sample been selected from among these excluded members and no responses obtained, the end result would have been exactly the same in terms of bias, with the added disadvantage of reducing the number of completed telephone responses and increasing the telephone follow-up costs.

[25] Coverage rate was determined as:

$$\text{Coverage} = R_M + P_F(1-R_M)R_T + (1-P_F)(1-R_M)0;$$

where R_M is the response rate to the mail survey (3,005/5,927 ≅ .507); P_F is the probability of being on the telephone interview frame, given nonresponse to survey (2,614/2,922 ≅ .895); and R_T is the telephone contact rate, given selection (1,259/1,500 ≅ .839).

B. Sampling Considerations

There are several factors that were considered in developing the sampling frame and in subsequent sampling procedures, toward producing an efficient sample (i.e., a sample that provided a maximum of useable information and satisfactory precision at minimal cost). To obtain such an efficient sample, certain characteristics of the questionnaire nonrespondents were considered. These characteristics can be conveniently grouped into five areas:

1) Type of nonresponse. Simple nonresponse resulting from nonreturn of questionnaire, or undeliverable nonresponse resulting from incorrect address information for the sample member.

2) Availability of previous data.

3) Previous postsecondary entry.

4) UB participation.

5) Other stratification factors used in initial sample selection.

Considerations related to the first area are primarily cost related, since contact of simple nonrespondents has been shown to be less expensive than contact of undeliverables, which involves additional tracing. Availability of previous data was considered, since complete information on an individual (base-year, first follow-up and second follow-up data) allows more meaningful analysis. Since major concern in the second follow-up was directed toward postsecondary outcomes, consideration of previous postsecondary entry was deemed important in obtaining a more efficient sample. Finally, it was felt that precision of analytic results would suffer if consideration were not directed toward past UB participation and other major subgroup distinctions (e.g., initial grade level cohort, sex, race, poverty status, and academic risk status). The sampling plan employed by RTI gave proper attention to these considerations, and is seen as representing an optimal or near-optimal approach.

C. Constructing the Sampling Frame, Stratification, and Ordering Procedures

The characteristics used in defining formal strata for the sampling frame were type of response, availability of previous data, and previous postsecondary entry.[26] The 2,615 nonrespondents and undeliverables were grouped into ten strata defined by a crossing of these three characteristics. (Originally 12 strata were formed, but two of these strata were empty.) The number of eligible individuals in each stratum on the final frame and the number sampled from each stratum is given in Table C.4.

Within each of the listed nonempty strata, frame-eligible students were ordered by the following variables, as listed.

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[26] Distributions of nonresponse among individuals in terms of the remaining characteristics were examined and revealed insufficient differences to warrant use of these remaining characteristics as formal strata; however, the remaining characteristics were considered in actual sampling through a systematic sampling approach.

Table C.4

TELEPHONE NONRESPONDENT SAMPLING FRAME AND SAMPLING RATES

Stratum	Number in Stratum	Percent Of Total	Number Sampled	Sampling Rate
Undeliverable, Prior PSE Entry, First Follow-Up Data Available	15	0.6%	15	1.000
Undeliverable, Prior PSE Entry, No First Follow-Up Data Available	4	0.2%	4	1.000
Undeliverable, No Prior PSE Entry, First Follow-Up Data Available	9	0.3%	3	.333
Undeliverable, No Prior PSE Entry, No First Follow-Up Data Available	0	-	0	-
Undeliverable, Unknown Prior PSE Entry, First Follow-Up Data Available	0	-	0	-
Undeliverable, Unknown Prior PSE Entry, No First Follow-Up Data Available	21	0.8%	9	.429
Nonrespondent, Prior PSE Entry, First Follow-Up Data Available	991	37.9%	851	.859
Nonrespondent, Prior PSE Entry, No First Follow-Up Data Available	181	6.9%	163	.901
Nonrespondent, No Prior PSE Entry, First Follow-Up Data Available	624	23.9%	170	.272
Nonrepondent, No Prior PSE Entry, No First Follow-Up Data Available	18	0.7%	5	.278
Nonrespondent, Unknown Prior PSE Entry, First Follow-Up Data Available	20	0.8%	7	.350
Nonrespondent, Unknown Prior PSE Entry, No First Follow-Up Data Available	732	28.0%	273	.373
Total	2,615	100.0%	1,500	.574

1. UB versus comparison classification as of base-year and first follow-up:[27]
    a. UB student in the base-year.
    b. Comparison student in the base-year with no UB activity reported in the first follow-up.
    c. Comparison student in the base-year with subsequent UB participation reported.
2. Grade at time of base-year:
    a. 10th.
    b. 11th.
    c. 12th.
3. Weighting Class. The 16 weighting classes reflect sex, ethnicity, poverty status, and academic risk status; they are defined in Table C.5 below.

Table C.5

DEFINITION OF 16 WEIGHTING CLASS CATEGORIES USED IN BASE-YEAR AND FIRST FOLLOW-UP STUDIES

	Poverty Status and Academic Risk			
Ethnicity and Sex	Poverty Risk	Poverty "Not Risk"	"Not Poverty" Risk	"Not Poverty" "Not Risk"
Black, male	1	2	3	4
Black, "not male"	5	6	7	8
White, all sexes	9	10	11	12
Others, all sexes	13	14	15	16

NOTE: The categories "not male", "not risk" and "not poverty", include cases with missing classification data.

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[27] Within strata defined by unavailability of prior data, the UB versus CS classification can be only "a" or "b." While these constraints limit the possible classifications on ordering category 1, they do not affect the logic of the ordering.

4. UB project affiliation. Every UB participant and comparison student was associated with one of the 54 sample UB projects.

Figure C.2 presents the stratification and ordering procedures graphically. The group of respondents and the 255 "hard-core" undeliverables were also ordered by the same variables since RTI desired comparison of the marginal distribution for each of the stratification and ordering variables by percent of respondents, nonrespondents, undeliverables with potential tracing, and "hard-core" undeliverables. Frequencies by response status for most of the stratification and ordering variables are presented in Tables C.6 through C.13. The project affiliation, balancing group, grade, status, and even postsecondary educational status showed little relationship to the response rate or the proportion falling into the three nonresponse categories. Prior response (i.e., availability of first follow-up data either by mail or telephone interview) was more highly correlated with response classification, as would be expected. Thus, one would not expect the "hard-core" undeliverables to differ from the population of respondents and nonrespondents on the frame for most of the stratification and ordering variables, suggesting that the method of weight adjustment used by RTI should have been reasonably effective in reducing any bias introduced.

D. Selection Procedures[28]

A systematic selection procedure was used to select the sample within each of the strata. A systematic sample with prescribed ordering is a simple and cost efficient procedure for assuring a reasonably proportional sample allocation across many variables, which has several advantages in this study. If individual strata had been formed using all the ordering variables described above, there would be many more strata than sample members. Many of the non-empty strata would contain very few members. If a stratified random sample were selected, at least one and preferably two members would have to be selected from each stratum. This could further distort the already unequal weighting and would thus increase the sampling error. On the other hand, if a simple random sample were selected, there would be no way to insure that most subgroups of interest would be adequately represented. The systematic sample provides the control for ordering variables while avoiding problems of stratifying the sample too deeply.

A systematic sample of the desired size was selected from each of the ten nonempty strata. Letting N_h represent the number of nonrespondents in the stratum and n_h represent the desired sample size, the procedure used was, first, to compute the interval $I_h = N_n/n_h$, and second, to select a random number s_h (not necessarily an integer unless I_h was an integer) between 0 and I_h. Then s_h, $s_h + I_h$, $s_h + 2I_h$, ... $s_h + (n_h - 1)I_h$ were used to define the n_h individuals to be sampled in stratum h. The selection was accomplished by computer under the supervision of an RTI statistician using previously-developed generalized software. The probability of selecting a sample member for the telephone follow-up given he or she was listed on the frame is given by n_h/N_h.

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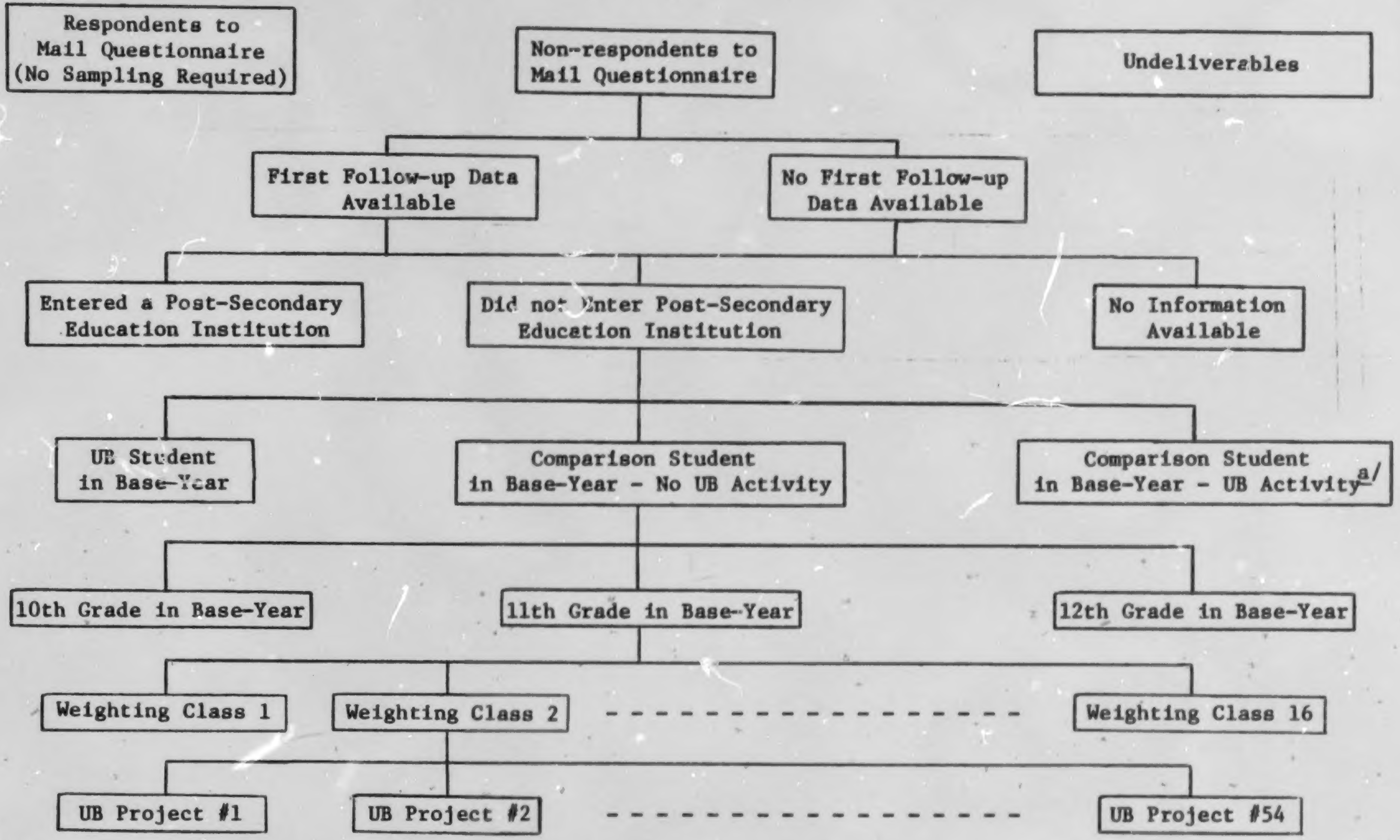
[28] See also Kish, L., 1965, (op. cit.).


Respondents to Mail Questionnaire (No Sampling Required)
Non-respondents to Mail Questionnaire
Undeliverables
First Follow-up Data Available
No First Follow-up Data Available
Entered a Post-Secondary Education Institution
Did not Enter Post-Secondary Education Institution
No Information Available
UB Student in Base-Year
Comparison Student in Base-Year - No UB Activity
Comparison Student in Base-Year - UB Activity a/
10th Grade in Base-Year
11th Grade in Base-Year
12th Grade in Base-Year
Weighting Class 1
Weighting Class 2
Weighting Class 16
UB Project #1
UB Project #2
UB Project #54

NOTE: Only one complete path is shown. Ordering patterns are identical for paths not shown.

[a] This category is not possible for students with no available first follow-up data.

Figure C.2. Upward Bound Second Follow-up Stratification and Ordering Procedures.

Table C.6

Response Status of Individuals By Former UB Participation

Response Status	Former Participation Status		
	UB	CS → UB[a]	CS
Hard Core Undeliverables	163 (4.5%)	2 (1.0%)	90 (4.4%)
Potential Trace Undeliverables	36 (1.0%)	0 (0.0%)	21 (1.0%)
Nonrespondents	1,638 (45.2%)	82 (42.7%)	897 (43.6%)
Respondents	1,784 (49.3%)	108 (56.3%)	1,051 (51.0%)
Total	3,621 (100.0%)	192 (100.0%)	2,059 (100.0%)

NOTE: These figures were based on response status classification as of 12/15/78; as such, they differ slightly from the final sampling frame. Table entries are number of cases defined in the category and column percentages, in parentheses.

[a] This category represents individuals originally selected into the nonparticipant group who reported subsequent UB program participation.

Table C.7

Nonresponse Status of Individuals By Availability of Previous Data

Response Status	Previous Data Availability	
	Available	Not Available
Hard Core Undeliverables	71 (1.7%)	184 (10.5%)
Potential Trace Undeliverables	29 (0.7%)	28 (1.6%)
Nonrespondents	1,667 (40.4%)	950 (54.3%)
Respondents	2,355 (57.1%)	588 (33.6%)
Total	4,122 (100.0%)	1,750 (100.0%)

NOTE: These figures were based on response status classification as of 12/15/78; as such, they differ slightly from the final sampling frame. Table entries are number of cases defined in the category and column percentages, in parentheses.

Table C.8

Response Status of Individuals By Prior PSE Exposure

Response Status	Prior PSE Exposure Status		
	Prior Exposure	No Prior Exposure	Unknown Prior Exposure
Hard Core Undeliverables	51 (1.7%)	38 (2.6%)	166 (11.6%)
Potential Trace Undeliverables	22 (0.8%)	11 (0.7%)	24 (1.7%)
Nonrespondents	1,192 (40.4%)	656 (43.9%)	769 (53.9%)
Respondents	1,686 (57.1%)	789 (52.8%)	468 (32.8%)
Total	2,951 (100.%)	1,494 (100.0%)	1,427 (100.0%)

NOTE: These figures were based on response status classification as of 12/15/78; as such, they differ slightly from the final sampling frame. Table entries are number of cases defined in the category and column percentages, in parentheses.

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Table C.9

Response Status of Individuals By Weighting Class

Response Status	Black, Male, Poverty, Risk	Black, Male, Poverty, Not Risk	Black, Male, Not Poverty, Risk	Black, Male, Not Poverty, Not Risk	Black, Not Male, Poverty, Risk	Black, Not Male, Poverty, Not Risk	Black, Not Male, Not Poverty, Risk	Black, Not Male, Not Poverty, Not Risk
Potential Trace Undeliverables	5 (1.0%)	6 (1.7%)	2 (0.7%)	3 (1.4%)	8 (1.5%)	4 (0.7%)	1 (0.5%)	2 (0.6%)
Nonrespondents	282 (56.5%)	166 (47.6%)	161 (57.9%)	115 (54.8%)	273 (51.4%)	256 (41.4%)	114 (52.8%)	154 (47.5%)
Respondents	212 (42.5%)	177 (50.7%)	115 (41.4%)	92 (43.8%)	250 (47.1%)	358 (57.9%)	101 (46.7%)	168 (51.9%)
Total	499 (100.0%)	349 (100.0%)	228 (100.0%)	210 (100.0%)	531 (100.0%)	618 (100.0%)	216 (100.0%)	324 (100.0%)

Response Status	White, Poverty, Risk	White, Poverty, Not Risk	White, Not Poverty Risk	Other, Poverty, Risk	Other, Poverty, Not Risk	Other, Not Poverty, Risk	Other, Not Poverty, Not Risk
Potential Trace Undeliverables	4 (1.4%)	7 (1.9%)	4 (1.1%)	1 (0.3%)	2 (0.6%)	3 (1.4%)	2 (1.0%)
Nonrespondents	126 (45.0%)	111 (29.4%)	154 (43.6%)	169 (53.5%)	148 (45.3%)	116 (53.5%)	105 (50.2%)
Respondents	150 (53.6%)	259 (68.7%)	195 (55.3%)	146 (46.2%)	177 (54.1%)	98 (45.1%)	102 (48.8%)
Total	280 (100.0%)	377 (100.0%)	353 (100.0%)	316 (100.0%)	327 (100.0%)	217 (100.0%)	209 (100.0%)

NOTE: These figures were based on response status classification as of 12/15/78; as such, they differ slightly from the final sampling frame. Table entries are number of cases defined in the category and column percentages, in parentheses. Hard core undeliverables are not included in this table.

Table C.10

Response Status of Individuals by Race/Ethnicity

Response Status	Race/Ethnicity Classification		
	Black	White	Other
Potential Trace Undeliverables	31 (1.0%)	18 (1.2%)	8 (0.8%)
Nonrespondents	1,521 (50.3%)	558 (36.6%)	538 (50.3%)
Respondents	1,473 (48.7%)	947 (62.2%)	523 (48.9%)
Total	3,025 (100.0%)	1,523 (100.0%)	1,069 (100.0%)

NOTE: These figures were based on response status classification as of 12/15/78; as such, they differ slightly from the final sampling frame. Table entries are number of cases defined in the category and column percentages, in parentheses. Hard core undeliverables are not included in these figures.

Table C.11

Response Status of Individuals By Poverty Status

Response Status	Poverty Status Classification	
	Poverty	Not Poverty
Potential Trace Undeliverables	37 (1.1%)	20 (0.9%)
Nonrespondents	1,531 (46.4%)	1,086 (46.8%)
Respondents	1,729 (52.4%)	1,214 (52.3%)
Total	3,297 (100.0%)	2,325 (100.0%)

NOTE: These figures were based on response status classification as of 12/15/78; as such, they differ slightly from the final sampling frame. Table entries are number of cases defined in the category and column percentages, in parentheses. Hard core undeliverables are not included in these figures.

Table C.12

Response Status of Individuals By Academic Risk Status

Response Status	Academic Risk Classification	
	Risk	Not Risk
Potential Trace Undeliverables	28 (1.0%)	29 (1.0%)
Nonrespondents	1,395 (51.9%)	1,222 (41.7%)
Respondents	1,267 (47.1%)	1,676 (57.3%)
Total	2,690 (100.0%)	2,927 (100.0%)

NOTE: These figures were based on response status classification as of 12/15/78; as such, they differ slightly from the final sampling frme. Table entries are number of cases defined in the category and column percentages, in parentheses. Hard core undeliverables are not included in these figures.

Table C.13

Distributional Statistics for Response Rates by Projects

Minimum	Q_1	Q_2	Q_3	Maximum
37.5%	47.4%	52.5%	58.5%	72.3%

E. Determining Sampling Rates[29]

The sampling rates for each of the strata were determined jointly by RTI and USOE at a meeting held at RTI in January 1979. On the basis of empirical return rates, RTI presented counts and proportions of totals in each of the important ordering categories by respondents, nonrespondents, and undeliverables; these results indicated that the proportion of nonresponse did not differ greatly among categories. This presentation also included estimates of contact rates within each category (using previously established response propensities) and calculations of the approximate sampling error and cost that could be anticipated.

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[29] See also Cochran, W. G. Sampling Techniques (Second Edition). New York: Wiley, 1963.

Based on experience gained in previous data collection efforts, costs for collecting data in the undeliverable and nonrespondent strata were calculated and used to determine the best sampling strategy in terms of minimizing the cost, and maximizing the precision and information available for analysis. Collection of data was considered to be more expensive in the undeliverable strata and the anticipated response rate was considered lower than for the nonrespondent strata. Consequently, RTI suggested sampling the undeliverable strata at a lower rate.

Forming strata based on the availability of first follow-up data served several purposes. First, a previous response by either mail or telephone was considered to indicate a greater likelihood for obtaining a response during the second follow-up. Second, since the analysis plan involved use of data from the first follow-up study, as well as that from the second follow-up, a full analysis would only be possible for second follow-up respondents with available first follow-up data. RTI therefore suggested that sampling rates should be greater within the strata defined by previously available data.

Stratification on the basis of prior PSE attendance was also cost-related, since the majority of second follow-up analysis questions are related to PSE outcomes. It was considered more efficient to obtain data from those who were known to have attended PSE previously than from those who were known to have no previous PSE exposure. RTI, therefore, recommended greater sampling rates in those strata defined by previous PSE exposure.

The actual sampling rates employed have been presented previously in Table C.4. It should be noted that the use of different sampling rates within strata resulted in differential selection probabilities. Statistical compensation for this difference was gained by assigning unequal weights (reciprocal of the selection probability) to each sampled member. Such unequal weighting can increase the sampling error, especially if the variability between individual responses within strata is approximately the same for all strata. However, since the cost or amount of information was considered to be different between strata, differential sampling rates were used to reduce the cost while still yielding acceptable precision.

A cost factor was assigned to each of the ten nonempty strata to reflect the relative cost of obtaining a completed telephone interview and the chance that the sample member would have entered a postsecondary educational institution. The cost factor was assumed equal to 1.0 for all respondents and all nonrespondents with known previous postsecondary entry. Table C.14 presents the model cost factors, $\$_h$, assumed for members in each of the ten strata. Based on RTI's experience in tracing addresses and response rates to the first follow-up survey, an anticipated response rate, r_h, was also assumed and incorporated into the model. The anticipated stratum response rates are presented in Table C.14 also.

Sample sizes were then determined to obtain the best possible precision (smallest sampling error) for the least cost, subject to (1) the constraint

Table C.14

ANTICIPATED RESPONSE RATES AND COST-VALUES OF OBTAINING COMPLETED TELEPHONE RESPONSE FOR EACH OF THE TEN NON-EMPTY STRATA

	Stratum Number									
	1	2	3	4	5	6	7	8	9	10
Response rate r_h	.9	.8	.9	.8	.9	.8	.9	.8	.9	.8
Relative Cost of Obtaining Completed Response $\$_h$	1	1	10	6	1	1	10	10	6	6

that members with postsecondary entry provide more data per cost unit and therefore, data for this group would be relatively less expensive, and (2) the overall constraint of selecting a sample of 1,500 nonrespondents and undeliverables.

Let N_h = the number of eligibles on the frame in stratum h,
n_h = the number of eligibles to be selected from stratum h,
r_h = the anticipated response rate for stratum h,
$\$_h$ = the relative cost factor of obtaining desired information from stratum h members,
σ_h^2 = variance for stratum h for items of interest.

Then, to determine the optimum values of n_h, the sample size for stratum h, the strategy used was to minimize the product of variance and cost subject to a total sample size constraint of 1,500. The variance model used was directed at a weighted sample mean, $\bar{\bar{x}}$, of the form

$$\bar{\bar{x}} = \sum_{h=1}^{H} \sum_{i=1}^{n_h} W_h \, x_{hi} / \sum_{h=1}^{H} \sum_{i=1}^{n_h} W_h$$

where $W_h = N_h/n_h$ is the common sampling fraction for selection in stratum h, H is the total number of strata, x_{hi} is a variable defined for individual i in stratum h, and N_h and n_h have been previously defined.

Letting $\bar{x}_h = \sum_{i=1}^{n_h} x_{hi}/n_h$ denote the stratum h sample mean, $\bar{\bar{x}}$ can be recast as

$$\bar{\bar{x}} = \sum_{h=1}^{H} N_h \, \bar{x}_h / N,$$

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where N depicts the total number of eligibles on the frame.

Ignoring finite population corrections and further assuming homogeneity of stratum variance, one arrives at the following simplified variance ($V(\bar{\bar{x}})$) model

$$V(\bar{\bar{x}}) = \sum_{h=1}^{H} N_h^2 \sigma^2/(n_h r_h N^2) = (\sigma^2/N^2) \sum_{h=1}^{H} N_h^2/(n_h r_h),$$

where r_h is the anticipated response rates from Table C.14. With the associated linear cost model for total cost, \$, of the form

$$\$ = \sum_{h=1}^{H} n_h \$_h,$$

the values of n_h which minimize the product of $V(\bar{\bar{x}})$ and \$ subject to the sample size constraint are given by

$$n_h = K\, N_h/\sqrt{\$_h\, r_h}\ ,$$

where

$$K = 1{,}500/ \sum_{h=1}^{H} N_h/\sqrt{\$_h r_h}\ . \qquad (1)$$

Solving equation (1) resulted in the values of n_h given in Table C.4.[30] An estimate of the magnitude of variance increase for the differential sampling rates over a self-weighting, strictly-proportional-to-N_h solution can be determined by calculating the design effect (DEFF). DEFF is defined by

$$\text{DEFF} = \frac{\text{Sampling variance of a simple random sample of size n}}{\text{Sampling variance of proposed design of size n}}\ .$$

Thus,

$$\text{DEFF} = \frac{\left(\sum_{h=1}^{11} n_h r_h\right)\left(\sum_{h=1}^{11} n_h r_h Z_h^2\right)}{\left(\sum_{h=1}^{11} n_h r_h Z_h\right)^2} = \sum_{h=1}^{11} \pi_h^2/\theta_h,$$

where $Z_h = N_h/n_h r_h$ and stratum 11 consists of the 2,981 mail respondents.

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[30] Actually, the sample sizes were determined from frame sizes (N_h values) available as of the last of December 1978. As soon as the stratum sample sizes were approved by the project officer, the cut-off date was determined. Since the final frame sizes differed only slightly from the December frame sizes, the optimum sample sizes were not recomputed.

Also $Z_{11} = 1$ since $n_{11}\, r_{11} = N_{11}$. The simplified expression for DEFF is in terms of frame size allocation fractions, $\pi_h = N_h/N$, and corresponding respondent allocation fractions, $\theta_h = n_h r_h / \sum_{h=1}^{11} n_h r_h$. For the proposed design and assumed values of r_h, DEFF = 1.34. Note that this value of DEFF was calculated by only comparing the effects of using differential sampling rates for the telephone follow-up survey. Each member is already assigned a weight based on the probability of selection in the base year. Thus, the overall sampling error is more complicated than described here and the overall DEFF is quite likely larger.

F. Effect of Bias Due to Target Population Exclusion

As mentioned previously, 308 base-year members were excluded from the telephone follow-up survey; however, these 308 members do not appear to differ on any of the stratification and ordering variables with the exception, of course, of availability of first follow-up data and postsecondary entry (see Tables C.6 through C. 13). These 308 members represent only about 5 percent of the 5,925 (6,050 minus 125 ineligibles) second follow-up eligibles. To examine the effect that excluding this segment of the population has on the proposed estimates of proportions, let

p_1 = the true proportion for the population represented by the 5617 members who either responded by mail or were listed on the telephone follow-up sampling frame,

p_2 = the true proportion for the population represented by the 308 excluded base year members; and

p = the true population proportion.

Assuming that the sample partitioning of those included and excluded reflects the population partitions, the true population proportion is then given by

$$p = \frac{5,617}{5,925}\, p_1 + \frac{308}{5,925}\, p_2 \cong .95p_1 + .05p_2 \ .$$

Results from the survey provided an unbiased estimate of p_1, called $\hat{p}_1$. The bias then is the difference between the true population value p and the expected value of the estimator $\hat{p}_1$; that is, $\text{Bias}(\hat{p}_1) = (p_1 - p)$.

A useful criterion to compare the biased estimator $\hat{p}_1$ of p with an unbiased estimator, is to calculate the mean square error (MSE) of the estimate measured from the population value. That is,

$$\text{MSE}\ (\hat{p}_1) = E(\hat{p}_1 - p)^2 = \text{Var}(\hat{p}_1) + (\hat{p}_1 - p)^2,$$
$$= \text{Var}(\hat{p}_1) + \text{Bias}^2\ (\hat{p}_1).$$

Table C.15 presents estimates of bias for varying proportions of p_1 and p_2.

Letting $\sigma_{\hat{p}_1} = \sqrt{\text{Var}(\hat{p}_1)}$ and B = Bias, then $|B/\sigma_{\hat{p}_1}|$ was calculated and is given in Table C.16. In order to calculate $\sigma_{\hat{p}_1}$, it has been assumed

$$\sigma_{\hat{p}_1} = \frac{1.34\ \hat{p}_1\ (1 - \hat{p}_1)}{nr_+} ,$$

where 1.34 is the anticipated DEFF and $nr_+ = 4{,}265$ represents the number of completed questionnaires by mail and telephone.

It has been shown[31] that if $|B/\sigma|$ is less than about 1/2, the frequency distribution for the biased estimator is almost identical to that of the unbiased estimator in regard to absolute errors $|\hat{p}_1 - p|$ of different sizes. Even at $|B/\sigma| = 0.6$, the changes in the probabilities as compared with those for $|B/\sigma| = 0$ are slight. Based on Tables C.15 and C.16, it appears that if the difference between p_1 and p_2 is less than .1, there is no problem in using $\hat{p}_1$ to estimate the true population proportion.

There are several techniques available to minimize the effect of bias on the estimate. One of these is the weighting class adjustment, which was used in this study (see Appendix G).

Table C.15

THE BIAS FOR ESTIMATOR $\hat{p}_1$ FOR THE INDICATED VALUES OF p_1 AND p_2, THE TRUE POPULATION PROPORTIONS

p_2 / p_1	$p-\hat{p}_1$ = bias								
	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0	.005	.010	.015	.020	.025	.030	.035	.040
.2	-.005	0	.005	.010	.015	.020	.025	.030	.035
.3	-.010	-.005	0	.005	.010	.015	.020	.025	.030
.4	-.015	-.010	-.005	0	.005	.010	.015	.020	.025
.5	-.020	-.015	-.010	-.005	0	.005	.010	.015	.020
.6	-.025	-.020	-.015	-.010	-.005	0	.005	.010	.015
.7	-.030	-.025	-.020	-.015	-.010	-.005	0	.005	.010
.8	-.035	-.030	-.025	-.020	-.015	-.010	-.005	0	.005
.9	-.040	-.035	-.030	-.025	-.020	-.015	-.010	-.005	0

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[31] Hansen, M. H., Hurwitz, W. N., and Wadow, W. G., Sample Survey Methods and Theory (Volume I). New York: Wiley, 1953 (p. 58).

Table C.16

VALUES OF B/σ FOR THE VALUES OF p_1 and p_2 INDICATED

p_2 p_1	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	0	.94	1.89	2.82	3.77	4.71	5.66	6.60	7.54
.2	.71	0	.71	1.41	2.12	2.83	3.53	4.24	4.95
.3	1.23	.62	0	.62	1.23	1.85	2.47	3.09	3.70
.4	1.73	1.15	.57	0	.57	1.15	1.73	2.31	2.89
.5	2.26	1.70	1.13	.57	0	.57	1.13	1.70	2.26
.6	2.89	2.31	1.73	1.15	.57	0	.57	1.15	1.73
.7	3.70	3.09	2.47	1.85	1.23	.62	0	.62	1.23
.8	4.95	4.24	3.53	2.83	2.12	1.41	.71	0	.71
.9	7.54	6.60	5.66	4.71	3.77	2.82	1.89	.94	0

Appendix D

Second Follow-up Questionnaire and Survey Materials

Appendix D

Second Follow-up Questionnaire and Survey Materials

This appendix contains the UB Second Follow-up Questionnaire, letters, and other survey materials that were used in the data collection effort for the UB second follow-up evaluation. The materials are presented in separate sections of this appendix, as follows:

Section I: Newsletters, Cover Letters, and Return Postcard
Section II: Tracing Letters to Departments of Motor Vehicles
Section III: First Mailout Questionnaire (Forms A and B), Instructions, and Cover Letters
Section IV: Thank You/Reminder Postcard
Section V: Second Mailout Cover Letter
Section VI: Institutional Request Package (Sample)

I. NEWSLETTERS, COVER LETTERS, AND RETURN POSTCARD

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF EDUCATION
BUREAU OF HIGHER AND CONTINUING EDUCATION
WASHINGTON, D.C. 20202

28 April 1978

Dear Study Member,

In 1973, while you were in high school, you were selected to participate in a national study being conducted for the U.S. Office of Education by the Research Triangle Institute. The purpose of this study, as you may recall, is to find out about the needs of young adults who may use the services of several educational and occupational programs sponsored by your Federal Government.

We last contacted you during the 1976-77 school year and asked you to complete a brief postcard questionnaire. Your responses to that and previous questionnaires have been very helpful. Findings have been presented to the Congress of the United States and have been published by several news services.

We want to take this opportunity to share with you some of the important findings of the study. These results, together with background information about the study, the Office of Education, and the Research Triangle Institute are included in the enclosed newsletter.

Since we are planning to continue the study, we have also enclosed a postage-paid return postcard to be used in providing name and address changes so that we can contact you again this fall. At that time, we will send you a brief questionnaire and a check as a token of our appreciation of your cooperation in the past. Please take the time to complete and mail the postcard so that the questionnaire and the check will reach you. I cannot overemphasize the importance of your continued participation in this study for the management of Federal Programs in the Office of Education.

Thank you for your generous assistance in this important study. You have my very best wishes for success in your chosen field of study or work.

Sincerely,

Alfred L. Moyé

Dr. Alfred Moyé
Deputy Commissioner,
Higher and Continuing Education

RESEARCH TRIANGLE INSTITUTE
POST OFFICE BOX 12194
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

RTI

26 May 1978

Dear Study Member,

We mailed a copy of the enclosed material to you in April of 1978; however, the mail was returned by the Postal Service indicating that the address we used was no longer appropriate. Since then, we have obtained a better address, and we are mailing the material to you again.

If we have contacted you by telephone to obtain your address, then do not bother to return the enclosed post card. If we have not contacted you by telephone, then please fill out the information on the post card and return it to us as soon as you can.

We hope that you will find the provided information about the study to be of some interest, and we want to take this opportunity to thank you again for your past assistance.

Sincerely,

G. J. Burkheimer
Project Director

(919) 541-6000 FROM RALEIGH, DURHAM AND CHAPEL HILL

NATIONWIDE STUDY OF YOUNG ADULTS

Department of Health, Education, and Welfare
OFFICE OF EDUCATION, WASHINGTON, DC 20202

Research Triangle Institute, P.O. Box 12194, Research Triangle Park, NC 27709 April 1978

WHAT'S HAPPENING TO THE NATION'S YOUNG ADULTS?

The Nationwide Study of Young Adults began in 1973 in an attempt to find out more about the educational plans and experiences of young adults, and particularly about participants in Upward Bound programs. High school students in the graduating classes of 1974, 1975, and 1976 were chosen for the study. The purpose of the study is to see if special federally funded educational and occupational programs (such as UB) are meeting the needs of young people.

The students chosen completed a questionnaire in 1973, and the same group was contacted in 1977 for further information on their experiences in and out of school. A third questionnaire will be sent this fall to all members of the chosen group, seeking additional information on education and work experiences.

The study results can be helpful only if the same group provides information for each follow-up questionnaire, so it is important that we keep in touch with you. Your participation in the study of young adults provides the U.S. Office of Education with information to continually evaluate and improve special programs. By completing your questionnaire this fall, you will help others who will be in school in the future.

PLEASE
MAIL THE
POST CARD
RTI
27709

ANOTHER QUESTIONNAIRE COMING THIS FALL

A new, second follow-up, questionnaire will be coming to you this fall.

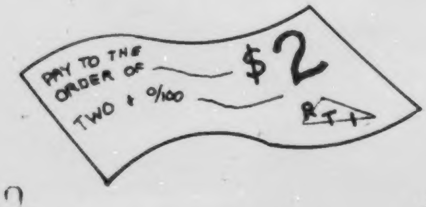
Also, we will be mailing you at that time a $2.00 check as a token of our appreciation for your cooperation in this study up until now. The check is yours to spend with no obligation.

Please be sure that we have your correct address so that the questionnaire and check *will* come to you—**SEND US THE ENCLOSED POST CARD!**

Linda Shaver is busy preparing the second follow-up questionnaire.

YOUR ROLE IN THE STUDY

Remember back in 1973, when we first asked you to participate in a nationwide study of young adults? This study, you may recall, is being conducted for the U.S. Office of Education by the Research Triangle Institute (RTI). *(continued on next page)*


PAY TO THE ORDER OF
$2
TWO + 0/100
RTI

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Your continued response provides valuable information for educational planning and program improvement. When the second follow-up questionnaire arrives, please fill it out carefully. We look forward to hearing from you.

LARGE NUMBERS COMPLETE HIGH SCHOOL

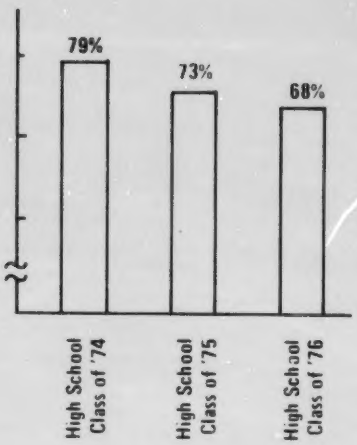
Answers to the last follow-up questionnaire indicate that almost all (96 percent) former Upward Bounders from the Class of '74 had gone on to graduate from high school.

Slightly lower graduation rates were reported by former Upward Bounders in the classes of '75 and '76, since they have had less time to complete their high school studies. In the class of '75, 93 percent had graduated and 81 percent of those in the class of '76 had graduated from high school.

ADDITIONAL EDUCATION CHOICE OF MANY

Seventy-one percent of the former Upward Bounders in the study reported entering some kind of school or college after high school. Entry rates differed among the three classes studied: 79 percent for the class of '74, 73 percent for the class of '75, and 68 percent for the class of '76.

PERCENTAGES OF UPWARD BOUNDERS ENTERING EDUCATION BEYOND HIGH SCHOOL



These differences are probably due to a year or two delay for some students in enrolling for further education after high school. Results for the class of '74 show that of those Upward Bounders who do not enroll for further education right after high school, 62 percent enroll sometime during the next three years.

Almost two-thirds of the former Upward Bounders who continued their education after high school were attending or had attended four-year colleges or universities. The others chose to enroll in two-year colleges or vocational-technical schools. About half of the total group were enrolled at institutions which had Upward Bound projects.

Most of the former Upward Bounders who entered education beyond high school reported that they were still in school at the time of the first follow-up survey (spring 1977). Eighty-five percent of the original high school class of '76 reported enrollment, 66 percent of the class of '75, and 63 percent of the class of '74.

We hope to find out more about your experiences in education following high school in the upcoming second follow-up survey.

MANY ARE WORKING

Sixty percent of the former Upward Bounders who were not attending school when the last survey was taken were either in the military or in the civilian work force.

Of those not in school, 52 percent were working full time and another 8 percent said that they had part-time jobs. Many of those remaining individuals had dropped out of the labor force temporarily—for example, to become homemakers.

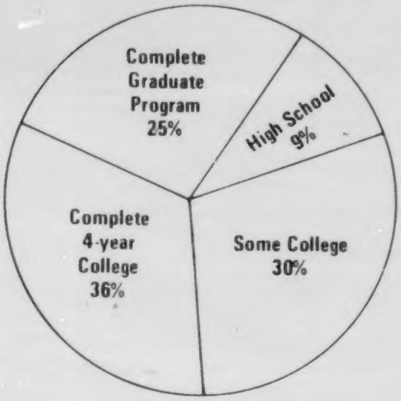
About four in ten of those who were still students at the time of the first follow-up survey also reported working at either full-time (9 percent) or part-time jobs (30 percent).

YOU HAVE SET YOUR SIGHTS HIGH

Former Upward Bounders reported high educational expectations when last surveyed, with 61 percent expecting to complete at least a four-year college education and one individual in four wanting to go on to complete a graduate program. Another 30 percent of the Upward Bounders expect to complete some college, including many who intend to finish one- or two-year programs at vocational-technical schools and community colleges.

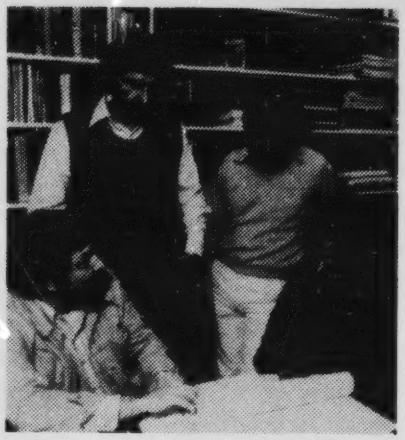
Interestingly, these expectations are even higher than those reported in 1973 as many former Upward Bounders apparently have become more confident and optimistic about the future.

HIGHEST EDUCATION EXPECTED



ANSWERS REVEAL SOME BARRIERS TO EDUCATION

Former Upward Bounders reported several areas in which they had encountered problems in obtaining their desired education. However, most individuals reported no serious problems.

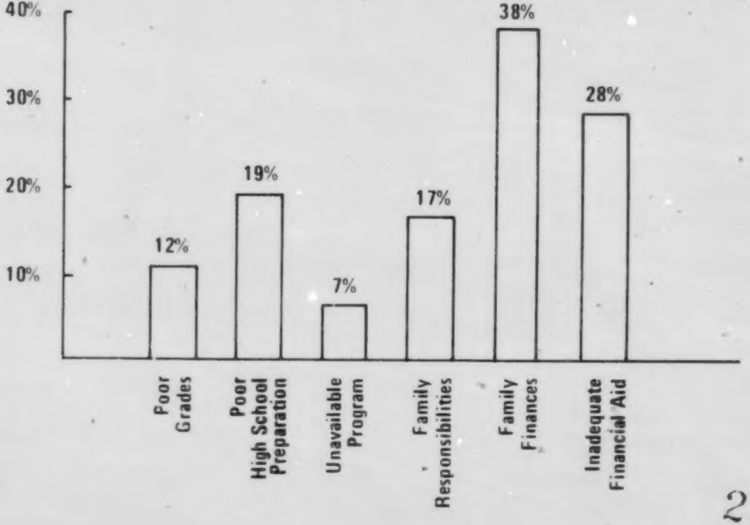


Project staff members John Riccobono, Graham Burkheimer, Eddie Fuentes, and Lucia Ward pore over study results.

Family finances and inadequate financial aid were reported most frequently as presenting problems in getting the kind of education one would like. Financial problems may also be at the heart of the difficulty for many who reported family responsibilities as a problem.

School-related problems—poor grades, poor high school preparation, and unavailable program—were reported less often; however, about one individual in five appears somewhat dissatisfied with his/her high school education.

PROBLEMS EXPERIENCED IN OBTAINING DESIRED EDUCATION
(Percentages of U.B. respondents reporting problems)



WHERE ARE YOU NOW?

Have you changed either your name or your address? Where will you be this fall? Who will always know where to reach you?

Please provide the answers to these questions on the enclosed postcard so that we will know where to send your check and questionnaire in October. Please mail the postcard to us promptly; no postage is required.

PLEASE FILL OUT AND MAIL THE POSTCARD TODAY!

YOU'RE A NEWSWORTHY GROUP

Your answers to the previous surveys have been computed and analyzed. The results from all previous questionnaires are interesting and informative. In fact, results are so interesting that the *New York Times*, *Washington Post*, *Reader's Digest*, and several other newspapers around the country have published articles on the study and its findings.

A MESSAGE FROM THE U.S. OFFICE OF EDUCATION

As many of you know, Upward Bound began as a pilot program in the Office of Economic Opportunity in 1965. At that time, $3 million was authorized to fund 17 projects at institutions of higher education across the country.

(continued on next page)

Since those early days of the program, Upward Bound has grown to more than 400 projects funded currently at $44 million. Program data now show that nearly 200,000 young men and women have participated in the program.

Projects are located in all 50 States, Guam, Puerto Rico, and the Virgin Islands.

Participants in the program have done well—hundreds have gone on to graduate schools here and abroad—and have taken their places in the decision-making process of the nation.

Today, the program is known far and wide and has recently been nominated by the Commissioner of Education to represent the Office of Education in the celebration of the International Year of the Child sponsored by the United Nations.

The Office of Education considers UB to be one of the most important Federal programs addressing major issues such as equalizing educational opportunities for young people. There is no doubt that the program has played a big role in implementing Affirmative Action programs, and in providing access to higher education for thousands of young people.

Those in the Office of Education believe that they can improve a program only if they know what is happening to program participants. Consequently, they need frequent evaluations, which includes your input. That is why this study is so important and why your participation in this study is so vital.

STRICTLY CONFIDENTIAL

Many people are concerned about the matter of confidentiality, or privacy, an area of major concern for all our project staff members.

When questionnaires are received at RTI, each person is assigned a number. Only numbers are used from that point on in handling your answers. The RTI Project Director makes it clear that "this number has *no* relationship to any other number previously assigned to the individual, such as a Social Security number." Your name or address is never associated with your answers and is never revealed to anyone except a small number of RTI study professionals.

All individual answers are kept in strictest confidence, and the questionnaires themselves are stored in a secure area until the study is completed, at which time they are destroyed.

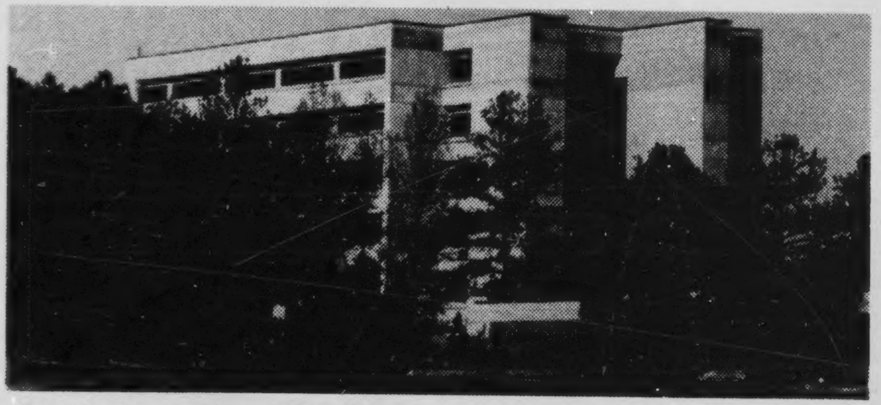
WHAT IS RTI?

Two hundred acres, with grass, pines, and a scattering of hardwoods would not seem to be a likely place for a research facility. But in this wooded setting lies Research Triangle Institute, a not-for-profit contract research organization. RTI is part of the 5,200 acre campus of the Research Triangle Park located between Raleigh, Durham, and Chapel Hill in piedmont North Carolina.

Founded in 1958, RTI is composed of 17 centers where all types of research, from educational studies to studies for the national space program, are performed. Over 900 people, both professional and support personnel, are currently employed at RTI, with professionals representing 110 degree fields.

RTI performs research for Federal, State, and local government agencies, foreign countries, foundations, and business clients ranging from small companies to national corporations.

For this study, RTI is under contract to the U.S. Office of Education. This study involves personnel from 4 of RTI's 17 centers: The Center for Educational Research and Evaluation, the Survey Operations Center, the Sampling Research and Design Center, and the Computer Applications Center.



One of the eleven buildings on the RTI campus, the George Watts Hill Building houses most of the study staff.

NATIONWIDE STUDY OF YOUNG ADULTS

Department of Health, Education, and Welfare
OFFICE OF EDUCATION, WASHINGTON, DC 20202

Research Triangle Institute, P.O. Box 12194, Research Triangle Park, NC 27709 April 1978

WHAT'S HAPPENING TO THE NATION'S YOUNG ADULTS?

The Nationwide Study of Young Adults began in 1973 in an attempt to find out more about the educational plans and experiences of young adults. High school students in the graduating classes of 1974, 1975, and 1976 were chosen for the study. The purpose of the study is to see if special federally funded educational and occupational programs are meeting the needs of young people.

The students chosen completed a questionnaire in 1973; and the same group was contacted in 1977 for further information on their experiences in and out of school. A third questionnaire will be sent this fall to all members of the chosen group, seeking additional information on education and work experiences.

The study results can be helpful only if the same group provides information for each follow-up questionnaire, so it is important that we keep in touch with you. Your participation in the study of young adults provides the U.S. Office of Education with information to continually evaluate and improve special programs. By completing your questionnaire this fall, you will help others who will be in school in the future.

PLEASE MAIL THE POST CARD
RTI 27709

ANOTHER QUESTIONNAIRE COMING THIS FALL

A new, second follow-up, questionnaire will be coming to you this fall.

Also, we will be mailing you at that time a $2.00 check as a token of our appreciation for your cooperation in this study up until now. The check is yours to spend with no obligation.

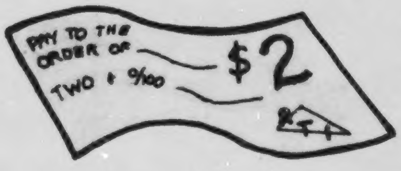
Please be sure that we have your correct address so that the questionnaire and check *will* come to you—**SEND US THE ENCLOSED POST CARD!**

Linda Shaver is busy preparing the second follow-up questionnaire.

YOUR ROLE IN THE STUDY

Remember back in 1973, when we first asked you to participate in a nationwide study of young adults? This study, you may recall, is being conducted for the U.S. Office of Education by the Research Triangle Institute (RTI).

(continued on next page)


PAY TO THE ORDER OF
TWO + 00/100
$2

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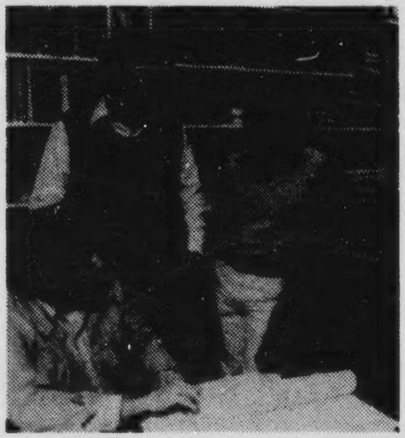
Your continued response provides valuable information for educational planning and program improvement. When the second follow-up questionnaire arrives, please fill it out carefully. We look forward to hearing from you.



Project staff members John Riccobono, Graham Burkheimer, Eddie Fuentes, and Lucia Ward pore over study results.

A MESSAGE FROM THE U.S. OFFICE OF EDUCATION

The Office of Education has recently restructured its Bureau concerned with programs of postsecondary education, creating a new Bureau of Student Financial Assistance (BSFA) and a Bureau of Higher and Continuing Education (BHCE).

BSFA contains all of the student financial assistance programs—the grant and loan programs. BHCE administers the remainder of the Federal programs which deal with institutional and student service programs authorized by the Higher Education Act of 1965, as amended.

BHCE participates in the Nationwide Study of Young Adults in which you have been a part since 1973. BHCE hopes to obtain sufficient information from this study to understand more fully the problems associated with secondary school attendance, postsecondary admission, and graduation.

Those in the Office of Education believe that they can improve the quality of the many federal programs only if they know what is actually happening to young adults. Thus, your help in this study has become an invaluable resource for the Bureau in making important policy decisions about students.

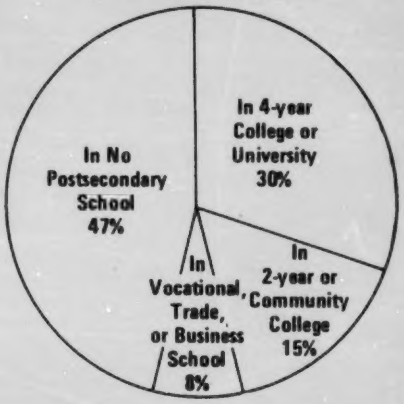
MANY ARE WORKING

Two years after high school, 77 percent of the young people who were no longer attending school were working. Of those not in school, 68 percent were working full time and another 9 percent said that they had part-time jobs. Many of those simply dropped out of the labor force temporarily—for example, to become homemakers.

About half of those who were still students two years after leaving high school also reported working at either full-time (15 percent) or part-time jobs (34 percent).

Only 25 percent of those who were working had received formal instruction to do the kind of work at which they were then employed. Generally speaking, most persons who had received formal instruction for their jobs found it relevant to the kind of work they actually did. Approximately 71 percent thought that they were able to apply on their job most of what they had learned in school, and 75 percent considered going to school and getting the training a wise choice. A total of 31 percent said they could have gotten their job without the training.

EDUCATIONAL CONTINUANCE AFTER HIGH SCHOOL



ADDITIONAL EDUCATION CHOICE OF MANY

This study and other RTI studies of young adults show that most young people choose to continue their education beyond high school. About 53 percent of the young people surveyed reported entering some kind of postsecondary school or college immediately after graduating from high school. Two years later, most of these students indicated that they were still attending school or had completed a short program of postsecondary study.

Thirty percent of all high

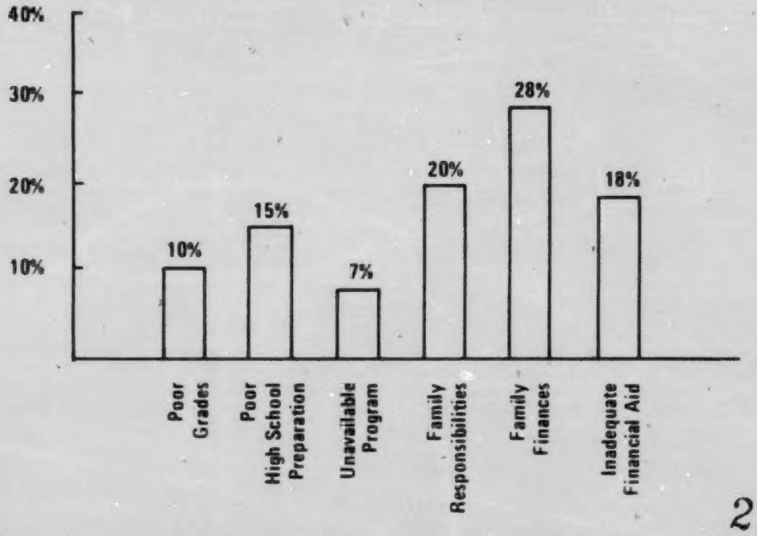
school seniors reported entering 4-year colleges or universities in the fall following graduation and about 15 percent indicated enrollment in 2-year or community colleges. Another 8 percent entered training programs at some vocational, trade, or business school.

Of those who entered 4-year colleges or universities, 74 percent were still enrolled in such institutions two years later; most of the others were no longer attending school. Two years after entering 2-year or community colleges, 37 percent of these young people reported that they had either graduated or transferred to 4-year colleges; another 23 percent of this group were still enrolled in a 2-year institution, and nearly 40 percent were no longer attending these schools.

ANSWERS REVEAL SOME BARRIERS TO EDUCATION

The young adults surveyed reported several areas in which they had encountered problems in obtaining their desired education. However, most individuals reported no serious problems.

PROBLEMS EXPERIENCED IN OBTAINING DESIRED EDUCATION
(Percentages of respondents reporting problems)



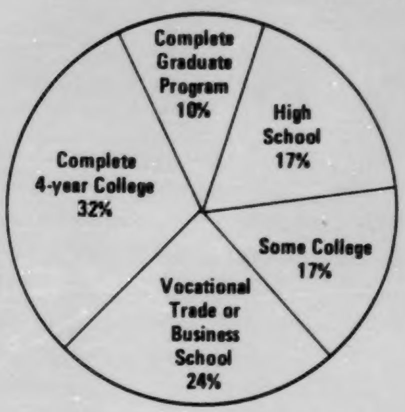
Family finances and inadequate financial aid were reported by many as presenting problems in getting the kind of education they would like. Financial problems may also be at the heart of the difficulty for those who reported family responsibilities as a problem.

School-related problems—poor grades, poor high school preparation, and unavailable program—were reported less often; however, 15 percent of the young people appear somewhat dissatisfied with their high school education.

YOU HAVE SET YOUR SIGHTS HIGH

Most young people expect to continue their education after graduating from high school. Over 40 percent of the young adults surveyed expected to obtain at least a 4-year college degree, with about one in four of these individuals planning to go on to complete a graduate program. Vocational, trade, or business school is the choice of many others, with about a quarter of the young people expecting to complete training programs at such institutions. Another 17 percent reported that they expected to obtain at least some college education.

HIGHEST EDUCATION EXPECTED



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FINANCIAL AID TO ATTEND SCHOOL

About half of the young people who continued their education beyond high school reported receiving some type of student financial aid during their freshman year; almost a third reported receiving Federal financial assistance. The most common types of student aid from all sources were grants and scholarships, with loans being the most widely used type of Federal aid. College work-study jobs and Federal loans are helping to supplement limited family resources for many young people obtaining postsecondary education and training, while Federal grants and scholarships are distributed primarily according to student need or achievement.

One of the eleven buildings on the RTI campus, the George Watts Hill Building houses most of the study staff.

STRICTLY CONFIDENTIAL

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Once the number has been assigned, a survey specialist checks your responses to make sure that we understand all your answers. Your name and address are then deleted from the questionnaire and the answers are entered directly into a protected computer file which can only be examined by project staff members who know the computer keyword necessary to access the file.

All individual answers are therefore kept in strictest confidence, and the questionnaires themselves are stored in a secure area until the study is completed, at which time they are destroyed.

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PLEASE FILL OUT AND MAIL THE POSTCARD TODAY!

II. TRACING LETTERS TO DEPARTMENTS OF MOTOR VEHICLES

RESEARCH TRIANGLE INSTITUTE
POST OFFICE BOX 12194
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

CENTER FOR EDUCATIONAL RESEARCH AND EVALUATION

11 September 1978

Mr. John A. Jones, Director
Department of Motor Vehicles
1 Capitol Street
State Capitol, Anystate 00000

Dear Mr. Jones:

The Research Triangle Institute is conducting a continuing national evaluation of the Upward Bound program under contract to the United States Office of Education. Two previous phases of the study have been completed and the third phase is scheduled to be completed in November 1979.

Information has been collected on a group of individuals originally selected as high school students in 1973 for this research effort. Over the course of the previous phases of the study, some of the individuals originally identified have been lost to our tracking system. Since the effectiveness of the evaluation is directly related to the response rate of the sample member, we wish to make every attempt to contact all participants in the sample, including those we are now unable to contact because of their loss within our tracking mechanism.

Attached is a list of names of individuals we are trying to contact, whom we believe to have a last established residence in your state. The names are followed by a date of birth and/or social security number. We would appreciate your reviewing your driver's license file and sending us the current addresses of those individuals whom you so locate.

Enclosed is a postage paid return envelope and a check to cover the fee for your services. The amount of the check is based on the most current information we have concerning your fee schedule; however, if the amount is insufficient, we will honor your invoice for any balance due.

Very truly yours,

G. J. Burkheimer, Jr.
Project Director

GJBjr:ls

(919) 541-6000 FROM RALEIGH, DURHAM AND CHAPEL HILL

RESEARCH TRIANGLE INSTITUTE
POST OFFICE BOX 12194
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

CENTER FOR EDUCATIONAL RESEARCH AND EVALUATION

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Enclosed is a postage paid return envelope for the requested data. Our most current information indicates that you require no fee for this service; however, should you have instituted a fee system, we will honor your voucher for customary charges.

Very truly yours,

G. J. Burkheimer, Jr.
Project Director

GJBjr:ls

(919) 541-6000 FROM RALEIGH, DURHAM AND CHAPEL HILL

III. FIRST MAILOUT QUESTIONNAIRE (FORMS A AND B), INSTRUCTIONS, AND COVER LETTERS

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF EDUCATION
BUREAU OF HIGHER AND CONTINUING EDUCATION
WASHINGTON, D.C. 20202

October 1978

Dear Study Member,

We are writing you once again to request your continued participation in the Nationwide Study of Young Adults. Last spring we mailed you a newsletter reporting some of the results of the study to date and indicating that we would contact you again this Fall to find out how you are progressing toward your educational and vocational goals.

Enclosed you will find a questionnaire that we are sending to all of the original group who were selected for the study. The completion of this short questionnaire should take only a little of your time. We have made every effort to make all questions clear and precise and to make certain that all questions are relevant. You can answer most of the questions by simply circling the number best corresponding to your situation at this point in time.

We are enclosing a $2.00 check, made out to you, as a small token of our appreciation for your efforts in providing us with information in the past. This check is yours to cash and spend as you wish with no strings attached. We have also provided a separate information sheet which provides instructions for completing the questionnaire. We want to emphasize that your answers will never be identified with you. Your name, as it is related to your answers, will be known only to a very small number of professional researchers involved with this study.

By completing this questionnaire you can help your Federal government make wise decisions. Your responses are valuable information. It is very important that you complete and return the questionnaire. There are only a few of you selected for the study from among the millions who were high school students in 1973. Although all of the originally selected group are being asked to provide this information, we need answers from all of you to obtain a true picture of what young adults as a group are doing and we want to be sure that each of you has the opportunity to be represented in the final results. Please answer all the questions which apply to you; the more complete your reply, the more helpful it will be in this important research. After you have completed the questionnaire, place it in the enclosed postage-paid return envelope, and drop it in a mailbox.

Thank you for your cooperation in this important study, and continued best wishes for success.

Sincerely,

Alfred L Moye

Dr. Alfred Moye
Deputy Commissioner
Higher and Continuing Education

RESEARCH TRIANGLE INSTITUTE
POST OFFICE BOX 12194
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

RTI

10 November 1978

Dear Study Member:

On 10 October, we mailed to you a copy of the enclosed material about the national study of young adults; however, the mail was returned by the Postal Service indicating that the address we used was no longer appropriate. Since then, we have obtained a better address, and we are mailing the material to you again.

Please notice that we have enclosed a check, made out to you, as a small token of our appreciation for your help in the past. We would like to point out that the check is dated 9 October and will become invalid 90 days after that date. Due to the delay in this mailing, we urge you to cash the check soon to avoid problems.

We hope that you will take the time to assist us once again with this important study, and we thank you in advance for your cooperation.

Sincerely,

G. J. Burkheimer
Project Director

(919) 541-6000 FROM RALEIGH, DURHAM AND CHAPEL HILL

DIRECTIONS

The separate questionnaire booklet consists of 15 questions, but you may not need to answer all of them. Please read carefully and answer each question that applies to you. It is important that you follow the directions for responding to each of the questions. Different questions call for different types of responding, such as:

- (Circle only one.)
- (Circle only one number in each column.)
- (Circle only one number on each line.)
- (Circle all that apply.)
- (Circle all that apply on each line.)

Sometimes you are asked to fill in a blank--in those cases, simply write your response in the line provided.

In answering some questions, the particular answer you give may be accompanied with an additional instruction, asking you to skip one or more questions. Here is an example:

Are you currently working?

(Circle only one)

No . . . . 1 → Go to Question 10

Yes . . . . 2 → Continue with Question 5

In the example, if you are not working, you would circle the 1 response and skip to question 10; but if you are working, you would circle the 2 response and continue with question 5.

Also, where you are asked to circle a number, please make a heavy circle. Circle as many numbers as the directions indicate for each question. Here is an example:

Are you currently working? (Circle only one.)

No . . . . [✓ 1]
Yes, full-time 2
Yes, part-time 3

If you are not currently working, then you would answer the question by circling the number corresponding to "No" as shown above.

When asked to provide only one answer, please read all possibilities carefully to determine the answer that most accurately reflects your situation. If you mistakenly circle a wrong answer, please erase (or place an X through) the wrong answer, and then circle the correct answer.

When asked to provide one or more answers to a question (that is, the instructions indicate to circle all answers that apply), please be sure that you read all possibilities and circle all answers that reflect your situation. Correct mistaken answers by erasing (or placing an X through) them.

When you have completed this questionnaire, please place it in the postage-paid, addressed envelope provided and mail it to:

NATIONWIDE STUDY OF YOUNG ADULTS
RESEARCH TRIANGLE INSTITUTE
POST OFFICE BOX 12194
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

THANK YOU FOR YOUR COOPERATION

OMB No. 51-S78020

Approval Expires June 30, 1979

NATIONWIDE STUDY OF YOUNG ADULTS:
SECOND FOLLOW-UP QUESTIONNAIRE

This study is authorized by law (20 USC 1226). While you are not required to respond, your cooperation is needed to make the results of this study comprehensive, accurate, and timely. All information which would permit identification of the individual will be strictly protected and will be used only by persons engaged in and for the purposes of the survey.

Prepared for the
Department of Health, Education, and Welfare
by Research Triangle Institute
Research Triangle Park, North Carolina 27709

OE FORM NUMBER 607-1

1. Did you complete high school?

(Circle only one.)

No, still in high school . . . . 1 → Go To Question 11

No, left high school without completing 2

Yes, graduated 3

Yes, left high school without graduating but have since passed a high school equivalency test, for example, the GED 4

(2, 3, 4) → Continue with Question 2

2. Have you attended any school providing education beyond high school like a college or university, service academy, business school, trade school, technical institute, vocational school, community college, and so forth?

(Circle only one.)

No . . . . 1 → Go To Question 11

Yes . . . . 2 → Continue with Question 3

3. Since leaving high school, have you withdrawn from any school before you completed your program of studies at that school? (Do not count graduate or professional schools.)

(Circle only one.)

No 1

Yes, but only to transfer to another school 2

Yes, but I subsequently returned to that school . . 3

Yes, but I subsequently returned to another school . 4

Yes, but I plan to return to school 5

Yes, and I do not plan to return to school 6

4. Please give the exact name and location of the school you are currently attending or last attended. Please do not abbreviate. (If you are currently attending or last attended a graduate or professional school, give the name and location of the school at which you completed your undergraduate program.)

School Name ________________________________

City ________________________ State ____________

5. During the last year (or current year if you are now enrolled) that you attended the school listed above, did you receive support from any of the following sources? (Please circle all that apply and write in the total amount received from each type of support.)

SCHOLARSHIPS OR GRANTS:

Basic Educational Opportunity Grant	01	Total Amount Received: ($________________)
Supplemental Educational Opportunity Grant	02	
ROTC scholarship or stipend	03	
Other Federal scholarship	04	
Veterans Administration Programs	05	
Social Security Benefits (for students 18-22 who are children of disabled or deceased parents)	06	
State scholarship	07	
Other scholarship or grant	08	

LOANS:

Federal Guaranteed Student Loan	09	Total Amount Received: ($________________)
State loan	10	
National Defense (Direct) Student Loan	11	
Other loan	12	

EARNINGS OR SAVINGS WHILE ATTENDING COLLEGE:

Summer earnings	13	Total Amount Received: ($________________)
College-sponsored work programs while taking courses	14	
Other earnings while taking courses	15	

6. During this period, how adequate were each of the following sources of financial assistance in meeting your educational expenses at the school?

(Circle only one number on each line.)

	No Support Needed	Support was needed, and support was:			
		Very Adequate	Adequate	Inadequate	Not Received or Very Inadequate
a. Scholarships or grants	1	2	3	4	5
b. Loans	1	2	3	4	5
c. Work opportunities	1	2	3	4	5
d. Total support from a, b, and c above	1	2	3	4	5
e. Family contributions	1	2	3	4	5

7. Education beyond high school may be financed in many different ways, depending on the particular needs and situation of the individual. If you could determine the manner in which your total college expenses were financed, what percent of your total support do you think should come from each of the sources listed below?

	Percent	
a. Scholarships and grants	______	Entries should total 100 percent
b. Loans	______	
c. College-sponsored work programs	______	
d. All other sources	______	

8. Which of the following best describes your student status most of the time while you attended school (or schools) providing education beyond high school?

	(Circle only one.)
Full-time only	1
Part-time day or part-time night only.	2
Part-time day and part-time night.	3
Combination of full-time and part-time	4

9. Since leaving high school, have you earned any certificate, license, diploma, or degree of any kind that is related to your studies?

	(Circle all that apply.)
No	1
Yes, a certificate (specify in what:________________). . .	2
Yes, a license (specify in what:____________________). . .	3
Yes, a 1-year, 2-year, or 3-year vocational degree or diploma	4
Yes, a 2-year academic degree.	5
Yes, a 4-year or 5-year college Bachelor's degree.	6
Yes, other (please specify:_________________________). . .	7

10. Listed below are several student services or programs (a through m) offered at some schools or colleges. Think about your experiences in all the schools you have attended since high school as related to each listed service or program. If a service has never been available to you, circle "1." If it has been available but you have never participated, circle "2." If you have ever participated in the service or program while in school, please indicate how frequently you participated by circling "3," "4," or "5." (Note: Circle only one number for each service or program listed.)

(Circle only one number on each line.)

	Not Available	Available But I Didn't Participate	YES, I PARTICIPATED:		
			Infrequently	Sometimes	Frequently
a. Tutoring by faculty	1	2	3	4	5
b. Tutoring by other students	1	2	3	4	5
c. Counseling on personal problems	1	2	3	4	5
d. Counseling on academic problems	1	2	3	4	5
e. Counseling on financial problems	1	2	3	4	5
f. Counseling on job or career choices	1	2	3	4	5
g. Remedial English instruction	1	2	3	4	5
h. Remedial mathematics instruction	1	2	3	4	5
i. Instruction in reading improvement	1	2	3	4	5
j. Instruction in improving writing skills	1	2	3	4	5
k. Help in learning how to study efficiently	1	2	3	4	5
l. Instruction in how to take tests	1	2	3	4	5
m. Assistance on finding part-time jobs	1	2	3	4	5

With your help, we are trying to find out about various educational and occupational programs sponsored by the Federal government so that they might better serve the needs of young people like yourself. To do this, we need school transcript information for those who have continued education beyond high school. Again, all information will be closely protected. If, however, there is some reason why you do NOT want us to obtain your transcript information, please check here ☐ and sign your name below.

____

(Sign only if you refuse)

11. Listed in the rows below are several time periods (a through v) from 1973 to present. Please indicate for each row whether you were attending school and the type of school you attended, including high school, during that time period, if any. If you attended more than one type of school in a time period, please indicate all such types of schools for that row. If you were on a semester system, Fall semesters typically include both Fall and Winter, Spring semesters typically include both Winter and Spring.

(Circle all that apply on each line.)

	Not Attending Any School	DURING TIME INDICATED I WAS ATTENDING:				
		High School	Vocational, Trade, or Business School	2-Year College	4-Year College	Graduate or Professional School
a. Summer 1973	1	2	3	4	5	6
b. Fall 1973	1	2	3	4	5	6
c. Winter 1973-74	1	2	3	4	5	6
d. Spring 1974	1	2	3	4	5	6
e. Summer 1974	1	2	3	4	5	6
f. Fall 1974	1	2	3	4	5	6
g. Winter 1974-75	1	2	3	4	5	6
h. Spring 1975	1	2	3	4	5	6
i. Summer 1975	1	2	3	4	5	6
j. Fall 1975	1	2	3	4	5	6
k. Winter 1975-76	1	2	3	4	5	6
l. Spring 1976	1	2	3	4	5	6
m. Summer 1976	1	2	3	4	5	6
n. Fall 1976	1	2	3	4	5	6
o. Winter 1976-77	1	2	3	4	5	6
p. Spring 1977	1	2	3	4	5	6
q. Summer 1977	1	2	3	4	5	6
r. Fall 1977	1	2	3	4	5	6
s. Winter 1977-78	1	2	3	4	5	6
t. Spring 1978	1	2	3	4	5	6
u. Summer 1978	1	2	3	4	5	6
v. Fall 1978	1	2	3	4	5	6

12. Please indicate how far in school you would like to get and how far you expect to get.

(Circle only one number in each column.)

	Would Like To Get	Expect To Get
High school only	1	1
Vocational, trade, or business school:		
Less than two years	2	2
Two years or more	3	3
College program:		
Less than two years of college	4	4
Two or more years of college	5	5
Finish college (four- or five-year degree)	6	6
Master's degree or equivalent	7	7
Ph.D., M.D., or equivalent	8	8

13. Are you currently working?

(Circle only one.)

No	1
Yes, part-time	2
Yes, full-time	3

14. Considering your entire education and work history, how satisfied are you with what you are doing now?

(Circle only one.)

Very satisfied	1
Somewhat satisfied	2
Neutral or no opinion	3
Somewhat dissatisfied	4
Very dissatisfied	5

15. Listed below are several problem areas (a through h) that some people experience in getting an education. For each listed problem area, please indicate whether you have experienced the problem and, if so, how much of a problem it has been in preventing you from getting the kind of education you would like to get. (Note: Circle only one number for each problem area listed.)

(Circle only one number on each line.)

		I DID EXPERIENCE THIS PROBLEM, AND:		
	I did not experience this problem	It has been a small problem	It has been a moderately large problem	It has been a very big problem
a. Poor grades	1	2	3	4
b. Poor high school preparation	1	2	3	4
c. Lack of personal or family finances	1	2	3	4
d. Inadequate financial aid	1	2	3	4
e. Program I wanted is not available	1	2	3	4
f. Family responsibilities	1	2	3	4
g. Lack of information on requirements for program I wanted	1	2	3	4
h. Lack of information about education required for the kind of work I want to do	1	2	3	4

THANK YOU FOR YOUR ASSISTANCE IN PROVIDING INFORMATION FOR THIS IMPORTANT STUDY. WHEN YOU HAVE COMPLETED THE QUESTIONNAIRE, PLEASE RETURN IN THE PROVIDED ENVELOPE TO:

Nationwide Study of Young Adults
Research Triangle Institute
P. O. Box 12194
Research Triangle Park, NC 27709

DIRECTIONS

The separate questionnaire booklet consists of 16 questions, but you may not need to answer all of them. Please read carefully and answer each question that applies to you. It is important that you follow the directions for responding to each of the questions. Different questions call for different types of responding, such as:

- (Circle only one.)
- (Circle only one number in each column.)
- (Circle only one number on each line.)
- (Circle all that apply.)
- (Circle all that apply on each line.)

Sometimes you are asked to fill in a blank--in those cases, simply write your response in the line provided.

In answering some questions, the particular answer you give may be accompanied with an additional instruction, asking you to skip one or more questions. Here is an example:

Are you currently working?

(Circle only one)

No . . . . 1 → Go to Question 10

Yes . . . . 2 → Continue with Question 5

In the example, if you are not working, you would circle the 1 response and skip to question 10; but if you are working, you would circle the 2 response and continue with question 5.

Also, where you are asked to circle a number, please make a heavy circle. Circle as many numbers as the directions indicate for each question. Here is an example:

Are you currently working? (Circle only one.)

No . . . . [✓ 1]
Yes, full-time 2
Yes, part-time 3

If you are not currently working, then you would answer the question by circling the number corresponding to "No" as shown above.

When asked to provide only one answer, please read all possibilities carefully to determine the answer that most accurately reflects your situation. If you mistakenly circle a wrong answer, please erase (or place an X through) the wrong answer, and then circle the correct answer.

When asked to provide one or more answers to a question (that is, the instructions indicate to circle all answers that apply), please be sure that you read all possibilities and circle all answers that reflect your situation. Correct mistaken answers by erasing (or placing an X through) them.

When you have completed this questionnaire, please place it in the postage-paid, addressed envelope provided and mail it to:

NATIONWIDE STUDY OF YOUNG ADULTS
RESEARCH TRIANGLE INSTITUTE
POST OFFICE BOX 12194
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

THANK YOU FOR YOUR COOPERATION

OMB No. 51-S78020

Approval Expires June 30, 1979

NATIONWIDE STUDY OF YOUNG ADULTS:
SECOND FOLLOW-UP QUESTIONNAIRE

This study is authorized by law (20 USC 1226). While you are not required to respond, your cooperation is needed to make the results of this study comprehensive, accurate, and timely. All information which would permit identification of the individual will be strictly protected and will be used only by persons engaged in and for the purposes of the survey.

Prepared for the
Department of Health, Education, and Welfare
by Research Triangle Institute
Research Triangle Park, North Carolina 27709

OE FORM NUMBER 607-2

1. Did you complete high school?

(Circle only one.)

No, still in high school . . . . 1 → Go To Question 11
No, left high school without completing 2
Yes, graduated 3
Yes, left high school without graduating but have since passed a high school equivalency test, for example, the GED 4

(2, 3, 4) → Continue with Question 2

2. Have you attended any school providing education beyond high school like a college or university, service academy, business school, trade school, technical institute, vocational school, community college, and so forth?

(Circle only one.)

No . . . . 1 → Go To Question 11
Yes . . . . 2 → Continue with Question 3

3. Since leaving high school, have you withdrawn from any school before you completed your program of studies at that school? (Do not count graduate or professional schools.)

(Circle only one.)

No 1
Yes, but only to transfer to another school 2
Yes, but I subsequently returned to that school . . 3
Yes, but I subsequently returned to another school . 4
Yes, but I plan to return to school 5
Yes, and I do not plan to return to school 6

4. Please give the exact name and location of the school you are currently attending or last attended. Please do not abbreviate. (If you are currently attending or last attended a graduate or professional school, give the name and location of the school at which you completed your undergraduate program.)

School Name ____

City ____________________________________ State ______________

5. During the last year (or current year if you are now enrolled) that you attended the school listed above, did you receive support from any of the following sources? (Please circle all that apply and write in the total amount received from each type of support.)

SCHOLARSHIPS OR GRANTS:

Basic Educational Opportunity Grant	01
Supplemental Educational Opportunity Grant	02
ROTC scholarship or stipend	03
Other Federal scholarship	04
Veterans Administration Programs	05
Social Security Benefits (for students 18-22 who are children of disabled or deceased parents)	06
State scholarship	07
Other scholarship or grant	08

Total Amount Received:
($________________)

LOANS:

Federal Guaranteed Student Loan	09
State loan	10
National Defense (Direct) Student Loan	11
Other loan	12

Total Amount Received:
($________________)

EARNINGS OR SAVINGS WHILE ATTENDING COLLEGE:

Summer earnings	13
College-sponsored work programs while taking courses	14
Other earnings while taking courses	15

Total Amount Received:
($________________)

6. During this period, how adequate were each of the following sources of financial assistance in meeting your educational expenses at the school?

(Circle only one number on each line.)

	No Support Needed	Support was needed, and support was:			
		Very Adequate	Adequate	Inadequate	Not Received or Very Inadequate
a. Scholarships or grants	1	2	3	4	5
b. Loans	1	2	3	4	5
c. Work opportunities	1	2	3	4	5
d. Total support from a, b, and c above	1	2	3	4	5
e. Family contributions	1	2	3	4	5

7. Education beyond high school may be financed in many different ways, depending on the particular needs and situation of the individual. If you could determine the manner in which your total college expenses were financed, what percent of your total support do you think should come from each of the sources listed below?

		Percent	
a.	Scholarships and grants	______	Entries should total 100 percent
b.	Loans	______	
c.	College-sponsored work programs	______	
d.	All other sources	______	

8. Which of the following best describes your student status most of the time while you attended school (or schools) providing education beyond high school?

(Circle only one.)

Full-time only 1

Part-time day or part-time night only. 2

Part-time day and part-time night. 3

Combination of full-time and part-time 4

9. Since leaving high school, have you earned any certificate, license, diploma, or degree of any kind that is related to your studies?

(Circle all that apply.)

No 1

Yes, a certificate (specify in what:________________). . . 2

Yes, a license (specify in what:____________________). . . 3

Yes, a 1-year, 2-year, or 3-year vocational degree or diploma 4

Yes, a 2-year academic degree. 5

Yes, a 4-year or 5-year college Bachelor's degree. 6

Yes, other (please specify:__________________________). . . 7

10. Listed below are several student services or programs (a through m) offered at some schools or colleges. Think about your experiences in all the schools you have attended since high school as related to each listed service or program. If a service has never been available to you, circle "1." If it has been available but you have never participated, circle "2." If you have ever participated in the service or program while in school, please indicate how frequently you participated by circling "3," "4," or "5." (Note: Circle only one number for each service or program listed.)

(Circle only one number on each line.)

	Not Available	Available But I Didn't Participate	YES, I PARTICIPATED:		
			Infrequently	Sometimes	Frequently
a. Tutoring by faculty	1	2	3	4	5
b. Tutoring by other students	1	2	3	4	5
c. Counseling on personal problems	1	2	3	4	5
d. Counseling on academic problems	1	2	3	4	5
e. Counseling on financial problems	1	2	3	4	5
f. Counseling on job or career choices	1	2	3	4	5
g. Remedial English instruction	1	2	3	4	5
h. Remedial mathematics instruction	1	2	3	4	5
i. Instruction in reading improvement	1	2	3	4	5
j. Instruction in improving writing skills	1	2	3	4	5
k. Help in learning how to study efficiently	1	2	3	4	5
l. Instruction in how to take tests	1	2	3	4	5
m. Assistance on finding part-time jobs	1	2	3	4	5

With your help, we are trying to find out about various educational and occupational programs sponsored by the Federal government so that they might better serve the needs of young people like yourself. To do this, we need school transcript information for those who have continued education beyond high school. Again, all information will be closely protected. If, however, there is some reason why you do NOT want us to obtain your transcript information, please check here ☐ and sign your name below.

(Sign only if you refuse)

11. Listed in the rows below are several time periods (a through v) from 1973 to present. Please indicate for each row whether you were attending school and the type of school you attended, including high school, during that time period, if any. If you attended more than one type of school in a time period, please indicate all such types of schools for that row. If you were on a semester system, Fall semesters typically include both Fall and Winter, Spring semesters typically include both Winter and Spring.

(Circle all that apply on each line.)

		DURING TIME INDICATED I WAS ATTENDING:				
	Not Attending Any School	High School	Vocational, Trade, or Business School	2-Year College	4-Year College	Graduate or Professional School
a. Summer 1973	1	2	3	4	5	6
b. Fall 1973	1	2	3	4	5	6
c. Winter 1973-74	1	2	3	4	5	6
d. Spring 1974	1	2	3	4	5	6
e. Summer 1974	1	2	3	4	5	6
f. Fall 1974	1	2	3	4	5	6
g. Winter 1974-75	1	2	3	4	5	6
h. Spring 1975	1	2	3	4	5	6
i. Summer 1975	1	2	3	4	5	6
j. Fall 1975	1	2	3	4	5	6
k. Winter 1975-76	1	2	3	4	5	6
l. Spring 1976	1	2	3	4	5	6
m. Summer 1976	1	2	3	4	5	6
n. Fall 1976	1	2	3	4	5	6
o. Winter 1976-77	1	2	3	4	5	6
p. Spring 1977	1	2	3	4	5	6
q. Summer 1977	1	2	3	4	5	6
r. Fall 1977	1	2	3	4	5	6
s. Winter 1977-78	1	2	3	4	5	6
t. Spring 1978	1	2	3	4	5	6
u. Summer 1978	1	2	3	4	5	6
v. Fall 1978	1	2	3	4	5	6

12. Please indicate how far in school you would like to get and how far you expect to get.

(Circle only one number in each column.)

	Would Like To Get	Expect To Get
High school only	1	1
Vocational, trade, or business school:		
Less than two years	2	2
Two years or more	3	3
College program:		
Less than two years of college	4	4
Two or more years of college	5	5
Finish college (four- or five-year degree)	6	6
Master's degree or equivalent	7	7
Ph.D., M.D., or equivalent	8	8

13. Are you currently working?

(Circle only one.)

No	1
Yes, part-time	2
Yes, full-time	3

14. Considering your entire education and work history, how satisfied are you with what you are doing now?

(Circle only one.)

Very satisfied	1
Somewhat satisfied	2
Neutral or no opinion	3
Somewhat dissatisfied	4
Very dissatisfied	5

15. Did you ever participate in an Upward Bound program?

(Circle all that apply.)

Never	1
Yes, in grade 10	2
Yes, in grade 11	3
Yes, in grade 12	4

16. Listed below are several problem areas (a through h) that some people experience in getting an education. For each listed problem area, please indicate whether you have experienced the problem and, if so, how much of a problem it has been in preventing you from getting the kind of education you would like to get. (Note: Circle only one number for each problem area listed.)

(Circle only one number on each line.)

		I DID EXPERIENCE THIS PROBLEM, AND:		
	I did not experience this problem	It has been a small problem	It has been a moderately large problem	It has been a very big problem
a. Poor grades	1	2	3	4
b. Poor high school preparation	1	2	3	4
c. Lack of personal or family finances	1	2	3	4
d. Inadequate financial aid	1	2	3	4
e. Program I wanted is not available	1	2	3	4
f. Family responsibilities	1	2	3	4
g. Lack of information on requirements for program I wanted	1	2	3	4
h. Lack of information about education required for the kind of work I want to do	1	2	3	4

THANK YOU FOR YOUR ASSISTANCE IN PROVIDING INFORMATION FOR THIS IMPORTANT STUDY. WHEN YOU HAVE COMPLETED THE QUESTIONNAIRE, PLEASE RETURN IN THE PROVIDED ENVELOPE TO:

Nationwide Study of Young Adults
Research Triangle Institute
P. O. Box 12194
Research Triangle Park, NC 27709

IV. THANK YOU/REMINDER POSTCARD

NATIONWIDE STUDY OF YOUNG ADULTS

Just a reminder ...

Last week we mailed you a short SECOND FOLLOW-UP questionnaire and a check.

If you have completed and mailed your questionnaire, thank you. We appreciate your continuing participation in this important study.

If you haven't completed your questionnaire yet, please fill it out and mail it today. You are an important person to us, and we want to hear from you.

If you haven't received your questionnaire yet, or if you have any questions, please call me on our toll-free number (800-334-8571).

Chris Myers

V. SECOND MAILOUT COVER LETTER

RESEARCH TRIANGLE INSTITUTE
POST OFFICE BOX 12194
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

CENTER FOR EDUCATIONAL RESEARCH AND EVALUATION

November 1978

Dear Study Member,

About one month ago we mailed you a letter from the Deputy Commissioner of Education of the United States and a check for $2.00, requesting your continued participation in a national study of young adults; one week later we mailed a postcard to remind you about the questionnaire. We have not yet heard from you, and we are therefore mailing you this additional reminder in case you may not have gotten around to sending us the requested information. In case you have misplaced the original package, we are including duplicates of the materials originally mailed to you.

We are also concerned that you may not have received the check that we sent you. If you did not receive the check, please let us know so that we can make arrangements for you to receive the money.

I would like to take this opportunity to stress that your response is very important and to urge you to complete and return the brief enclosed questionnaire, if you have not already done so. This will require very little of your time and will assist us greatly in providing your federal government with valuable information.

Thank you for your continued help in assisting us with this important research.

Very truly yours,

G. J. Burkheimer, Jr.
Project Director

(919) 541-6000 FROM RALEIGH, DURHAM AND CHAPEL HILL

VI. INSTITUTIONAL REQUEST PACKAGE

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF EDUCATION
BUREAU OF HIGHER AND CONTINUING EDUCATION
WASHINGTON, D.C. 20202

March 1979

Dear Registrar:

The Research Triangle Institute (RTI) is currently under contract with the United States Office of Education to continue a national evaluation of the Upward Bound program, a federally-funded program designed to help selected low-income high school students acquire the skills and motivation necessary to enter and successfully complete postsecondary education. Two previous phases of the study have been undertaken, and RTI is now conducting a second follow-up effort scheduled to be concluded in November 1979. Information is being collected on the group of students originally selected for the research effort. Results from this study will provide evaluative and program management information to members of Congress, U.S. Office of Education officials, and local project personnel.

The enclosed package of material has been sent to you because one or more of the students in our study have indicated current or former enrollment at your school. It is extremely important for the study to obtain a copy of the school transcripts of these individuals. The students who indicated attendance at your institution, with their approximate dates of last enrollment, are listed on the enclosed "Student Listing Form." Please designate someone to return the copies of the requested student transcripts to RTI in the postage-paid envelope provided. To expedite reimbursement for any clerical and reproduction expenses relating to this request, please complete and return the enclosed voucher to RTI. We are also enclosing a "Record of Disclosure" for each student listed which documents that we have accessed his or her file to obtain the transcript information. Please place this record in each student's file.

All transcript information (as is the case with all study information) will be treated in conformity with the Family Educational Rights and Privacy Act of 1974. This information will be reported in grouped form only so that no individual student or school can be identified. In this regard, please be assured that compliance with this request is clearly not in violation of the individual's rights under current privacy legislation. On the contrary, this legislation specifically recognizes the need for access to such information in connection with the evaluation of federally supported education programs. A more detailed explanation of the privacy regulations as they pertain to this study and of the procedures that are employed to insure protection of the information collected is provided separately in the enclosed statement on that subject. Also enclosed is a legal interpretation of the Privacy Legislation as specifically related to this study by the Office of the General Counsel of the Department of Health, Education, and Welfare, together with referenced excerpts from the applicable regulations. Nonetheless, because of our sensitivity to the individual's concerns in this area, all students or their parents have been notified of our intention to obtain their school transcripts and given the opportunity to refuse such access. Students' wishes in this matter are being honored.

Your cooperation in this important study is greatly appreciated. For further information, please contact the DHEW, USOE Project Officer, Dr. C. Dennis Carroll (202-245-8057), or the RTI Project Director, Dr. Graham Burkheimer (919-541-6331).

Sincerely,

Alfred L Moye

Dr. Alfred Moye
Deputy Commissioner,
Higher and Continuing Education

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20201

OFFICE OF THE GENERAL COUNSEL

December 21, 1977

MEMORANDUM

TO: Mr. Dennis Carroll
OPBE/OE

FROM: Education Division
OFFICE OF THE GENERAL COUNSEL

SUBJECT: Whether an educational institution may release information from students' education records to an OE contractor conducting an evaluation of Upward Bound without obtaining the students' consent?

You requested a written statement from our office regarding the above issue. An institution may release information to an OE contractor evaluating Upward Bound without obtaining the students' consent and without violating the Family Educational Rights and Privacy Act. There is a specific exception to the consent requirement in the FERPA for authorized representatives of the Commissioner under certain circumstances:

> (C) authorized representatives of (i) the Comptroller General of the United States, (ii) the Secretary, (iii) an administrative head of an education agency (as defined in section 408(c), or (iv) State educational authorities, under the conditions set forth in paragraph (3) of this subsection;
>
> (3) Nothing contained in this section shall preclude authorized representatives of (A) the Comptroller General of the United States, (B) the Secretary, (C) an administrative head of an education agency or (D) State educational authorities from having access to student or other records which may be necessary in connection with the audit and evaluation of Federally-supported education programs, or in connection with the enforcement of the Federal legal requirements which relate to such programs; PROVIDED, That except when collection of personally identifiable information is specifically authorized by Federal law, any data collected by such officials shall be protected in a manner which will not permit the personal identification of students and their parents by other than those officials, and such personally identifiable data shall be destroyed when no longer needed for such audit, evaluation, and enforcement of Federal legal requirements.

The records of nonparticipating students as well as students participating in Upward Bound may be released when the information is necessary for the evaluation.

The institution would of course have to comply with the requirements relating to redisclosure and records of access. (See 45 CFR §§99.32-99.33.)

Steven N. Schatken, Chief
Special Services Branch

By Susan Steward
Susan C. Steward
Attorney

cc: Mr. Riley
Ms. Reilly

Privacy Regulations and Protection of Data

Evaluation Study of the Upward Bound Program:
A Second Follow-Up
Research Triangle Institute

Throughout the study of the Upward Bound program the Research Triangle Institute (RTI) has consistently exercised every precaution to protect the identity of every participant, whether student, staff member, project, or school. In addition to compliance with privacy legislation, RTI operates under additional restriction imposed by an internal Committee on Human Rights. Procedures that RTI has followed include:

- Source documents are processed as received.
- Overnight storage of source documents is provided in a locked and secure work area.
- As soon as an identifying code is affixed, individually identifying information (e.g., name and address) is stripped from source documents.
- A small number of senior project personnel control access to source documents during all stages of processing and storage.
- Storage of source documents is provided in a locked, controlled-access, well-ventilated, vault-like room at RTI.
- Source documents are stored only for the course of the study and are destroyed when they are no longer required.
- Machine-readable files are maintailed in a secure computer facility.
- Encoding systems are used for maintaining privacy of machine-readable files so that names and addresses of individuals cannot be meaningfully associated with other information that has been collected.
- Access to machine-readable files is limited to a small number of project staff by built-in computerized checks of any attempt to read or copy stored information.
- Information is reported only for groups, never on an individual basis.
- Name and address information is not provided to the federal contracting agency.

This study is being conducted in compliance with the Family Educational Rights and Privacy Act of 1974. In accordance with Section 99.31 of the regulations published in the Federal Register on June 17, 1976 (enclosed), governing the Act, schools are permitted to disclose, without consent, personally identifiable information from students' educational records to authorized representatives of the Secretary of HEW in connection with the evaluation of federally supported education programs. RTI, as the evaluation contractor, assumes the function of authorized representative of the Secretary. Schools may thus feel free to cooperate with RTI without fear of violating the provisions of the Family Educational Rights and Privacy Act. In accordance with the provisions of the Act, whenever RTI data gatherers are given access to student files, a record of that access and the purpose will be left in the student's folder. These procedures have been worked out in cooperation with appropriate officials in HEW and have been found to meet legislative requirements designed to protect the privacy of study participants.

Any additional local or State requirements or questions regarding protection of information and/or individual rights may be taken up with the RTI Project Director, Dr. Graham Burkheimer, at 919-541-6331; or with the USOE Project Officer for the study, Dr. C. Dennis Carroll, at 202-245-8057.

federal register

THURSDAY, JUNE 17, 1976

THE NATIONAL ARCHIVES OF THE UNITED STATES
1934

PART II:

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Office of the Secretary

■

PRIVACY RIGHTS OF PARENTS AND STUDENTS

Final Rule on Education Records

§ 99.31 Prior consent for disclosure not required.

(a) An educational agency or institution may disclose personally identifiable information from the education records of a student without the written consent of the parent of the student or the eligible student if the disclosure is—

(1) To other school officials, including teachers, within the educational institution or local educational agency who have been determined by the agency or institution to have legitimate educational interests;

(2) To officials of another school or school system in which the student seeks or intends to enroll, subject to the requirements set forth in § 99.34;

(3) Subject to the conditions set forth in § 99.35, to authorized representatives of:

(i) The Comptroller General of the United States,

(ii) The Secretary,

(iii) The Commissioner, the Director of the National Institute of Education, or the Assistant Secretary for Education, or

(iv) State educational authorities;

(4) In connection with financial aid for which a student has applied or which a student has received; *Provided*, That personally identifiable information from the education records of the student may be disclosed only as may be necessary for such purposes as:

(i) To determine the eligibility of the student for financial aid,

(ii) To determine the amount of the financial aid,

(iii) To determine the conditions which will be imposed regarding the financial aid, or

(iv) To enforce the terms or conditions of the financial aid;

(5) To State and local officials or authorities to whom information is specifically required to be reported or disclosed pursuant to State statute adopted prior to November 19, 1974. This subparagraph applies only to statutes which require that specific information be disclosed to State or local officials and does not apply to statutes which permit but do not require disclosure. Nothing in this paragraph shall prevent a State from further limiting the number or type of State or local officials to whom disclosures are made under this subparagraph;

(6) To organizations conducting studies for, or on behalf of, educational agencies or institutions for the purpose of developing, validating, or administering predictive tests, administering student aid programs, and improving instruction, *Provided*, That the studies are conducted in a manner which will not permit the personal identification of students and their parents by individuals other than representatives of the organization and the information will be destroyed when no longer needed for the purposes for which the study was conducted; the term "organizations" includes, but is not limited to, Federal, State and local agencies, and independent organizations;

(7) To accrediting organizations in order to carry out their accrediting functions;

(8) To parents of a dependent student, as defined in section 152 of the Internal Revenue Code of 1954;

(9) To comply with a judicial order or lawfully issued subpoena; *Provided*, That the educational agency or institution makes a reasonable effort to notify the parent of the student or the eligible student of the order or subpoena in advance of compliance therewith; and

(10) To appropriate parties in a health or safety emergency subject to the conditions set forth in § 99.36.

(b) This section shall not be construed to require or preclude disclosure of any personally identifiable information from the education records of a student by an educational agency or institution to the parties set forth in paragraph (a) of this section.

[20 U.S.C. 1232g(b)(1)]

§ 99.32 Record of disclosures required to be maintained.

(a) An educational agency or institution shall for each request for and each disclosure of personally identifiable information from the education records of a student, maintain a record kept with the education records of the student which indicates:

(1) The parties who have requested or obtained personally identifiable information from the education records of the student, and

(2) The legitimate interests these parties had in requesting or obtaining the information.

(b) Paragraph (a) of this section does not apply to disclosures to a parent of a student or an eligible student, disclosures pursuant to the written consent of a parent of a student or an eligible student when the consent is specific with respect to the party or parties to whom the disclosure is to be made, disclosures to school officials under § 99.31(a)(1), or to disclosures of directory information under § 99.37.

(c) The record of disclosures may be inspected:

(1) By the parent of the student or the eligible student,

(2) By the school official and his or her assistants who are responsible for the custody of the records, and

(3) For the purpose of auditing the recordkeeping procedures of the educational agency or institution by the parties authorized in, and under the conditions set forth in § 99.31(a)(1) and (3).

(20 U.S.C. 1232g(b)(4)(A))

§ 99.33 Limitation on redisclosure.

(a) An educational agency or institution may disclose personally identifiable information from the education records of a student only on the condition that the party to whom the information is disclosed will not disclose the information to any other party without the prior written consent of the parent of the student or the eligible student, except that the personally identifiable information which is disclosed to an institution, agency or organization may be used by its officers, employees and agents, but only for the purposes for which the disclosure was made.

(b) Paragraph (a) of this section does not preclude an agency or institution from disclosing personally identifiable information under § 99.31 with the understanding that the information will be redisclosed to other parties under that section; *Provided*, That the recordkeeping requirements of § 99.32 are met with respect to each of those parties.

(c) An educational agency or institution shall, except for the disclosure of directory information under § 99.37, inform the party to whom a disclosure is made of the requirement set forth in paragraph (a) of this section.

[20 U.S.C. 1232g(b)(4)(B)]

TRANSCRIPT VOUCHER

Directions: Please complete Sections A, B and C below and mail the white and yellow copies of this voucher, together with photocopies of the requested transcripts, to the Research Triangle Institute. A postage paid return envelope is enclosed for your convenience. Keep the pink copy of the voucher for your records.

Payment will be mailed promptly by the Research Triangle Institute to the address provided in Section A.

A. Name of Institution Providing Transcripts:

____

Address to which reimbursement is to be sent:

____

____

____

B. Number of Transcript Photocopies Provided: ____________

Usual and Customary Charge per Transcript: X____________

Total Amount Due the Institution: $____________

C. Authorizing Signature: ____________________

Title: ____________________

Date: ____________________

Disposition: Send original and yellow copy to RTI: retain pink copy for records.

EVALUATION STUDY OF THE UPWARD BOUND PROGRAM

Conducted for U.S. Office of Education, Department of Health, Education, and Welfare, by Research Triangle Institute, PO Box 12194, Research Triangle Park, NC 27709.

RECORD OF DISCLOSURE

DATE:

SCHOOL NAME:

STUDENT NAME:

The Commissioner of Education has directed the Research Triangle Institute to conduct an evaluation of the Upward Bound program and has requested a copy of this student's transcript for use in this evaluation.

This request is in conformity with applicable State and Federal privacy laws and regulations. For further information, please contact the U. S. Office of Education (202-245-8057) or the Research Triangle Institute (919-541-6000).

Graham J. Burkheimer
Project Director
Research Triangle Institute
Post Office Box 12194
Research Triangle Park, N. C. 27709

RALEIGH INSTITUTE OF TECHNOLOGY
2505 15TH STREET
RALEIGH, NC 27608

THE STUDENTS LISTED BELOW HAVE INDICATED THAT THEY ATTENDED YOUR INSTITUTION ON OR AFTER THE DATES INDICATED. PLEASE PROVIDE TRANSCRIPTS FOR STUDENTS LISTED. ALL STUDENTS LISTED, OR THEIR PARENTS, HAVE BEEN NOTIFIED OF OUR INTENTION TO OBTAIN TRANSCRIPTS AND GIVEN THE OPPORTUNITY TO REFUSE ACCESS. STUDENTS' WISHES IN THIS MATTER ARE BEING HONORED. A VOUCHER FOR REIMBURSEMENT, RETURN ENVELOPE, AND RECORDS OF DISCLOSURE FOR ALL LISTED STUDENTS HAVE BEEN PROVIDED.

STUDENT NAME	APPROXIMATE DATE OF LAST ENROLLMENT
JOHN SMITH	FALL 1978
JANE JONES	SPRING 1977
PAUL GREEN	FALL 1977

RESEARCH TRIANGLE INSTITUTE
POST OFFICE BOX 12194
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

CENTER FOR EDUCATIONAL RESEARCH AND EVALUATION

May 10, 1979

Dr. John Jones
Any University
Any Street
Any Town, Any State 00000

Dear Dr. Jones:

Enclosed you will find the package of materials that we discussed with you during our recent telephone conversation. As explained in that conversation, we originally mailed a similar package to your school in March. Since you did not receive it, we are sending a replacement set with this letter. The enclosed materials include: a letter from the Deputy Commissioner for Higher and Continuing Education, pertinent sections regarding privacy regulations as related to Education Records, a legal interpretation from the Office of General Counsel, a statement of privacy regulation procedures implemented for this study, a listing of students for whom transcripts are requested, a record of disclosure for the file of each student listed, and a voucher to facilitate payment to your institution for the cost incurred in providing the transcripts requested. Again, we regret any additional inconvenience caused your office due to your not receiving our original request.

Thank you for your cooperation and timely attention to this matter. Should you have any additional questions, please feel free to call me or Dr. John Riccobono (toll free) at 1-800-334-8571.

Very truly yours,

G. J. Burkheimer, Jr., Ph.D.
Project Director

GJB:bge

Enclosure

(919) 541-6000 FROM RALEIGH, DURHAM AND CHAPEL HILL

Appendix E

Data Collection and Processing

Appendix E

Data Collection and Processing

I. GENERAL

This appendix describes the data collection and processing procedures for the second follow-up study of the UB program. Instrument development, mail and telephone survey activities, acquisition and use of extant data files, receipt control, and manual and machine processing procedures are described in detail.

The remainder of this introductory section provides a general description of data collection and processing, an overview of quality control procedures, and a description of procedures used to ensure data confidentiality. Section II provides a description of the several data sources used. Section III details all survey data collection activities and provides response rate information. Section IV describes the survey control system that was used in this study. Section V considers manual processing activities for questionnaires and transcripts. Section VI presents the details of machine processing of data, and Section VII provides information relating to the quality of student data.

A. Overview of Data Collection and Processing

The second follow-up study of the UB program was a continuation of a data collection effort for the sample of UB and comparison students who were selected for participation in the base-year survey (see Appendix C, for base-year and follow-up sampling methodologies). In preparation for second follow-up data collection, three distinct but related efforts to update directory file information (i.e., name and address) for all eligible sample members were conducted. The first effort was initiated through BHCE/USOE and entailed a request to UB projects involved in the base-year study to initiate local tracing operations toward obtaining available directory file updates. The second approach was initiated at RTI, and involved mailing a newsletter (containing relevant findings from the base-year and first follow-up studies) and a request for corrected directory file information to all study sample members (see Appendix D). Newsletters that were returned by the postal service as undeliverable generated telephone tracing activities in an attempt to locate the sample members. A final effort for those not located through previous steps was a request for directory information from Departments of Motor Vehicles of the state of last known address.

Data collection in the second follow-up survey was accomplished in two stages. The first stage involved a mail survey, using a brief self-administered questionnaire, of all eligible sample members. This mail survey consisted of an initial questionnaire mailout, followed one week later by a mailed thank-you/reminder postcard. About four weeks after the initial questionnaire mailing, a second questionnaire was sent to all who had not responded by that time. Four weeks following the second mailing, a probability sample of 1,500 mail survey nonrespondents was selected for subsequent telephone interview to gather the information requested on the questionnaire. The second stage of data collection involved obtaining academic transcripts from the PSE institutions currently or last attended by sample members, as indicated by the completed questionnaires or telephone interviews. An Institutional

Request Package was developed and mailed to all identified postsecondary institutions.

In addition to data obtained from the second follow-up questionnaires and student PSE transcripts, other data were obtained from existing sources. Student background information, prior education and work status, and prior UB participation status were available from a student master file comprised of data collected or constructed during the base-year and first follow-up studies. Information characterizing the PSE institutions attended by sample members was obtained from an institutional data file provided by USOE.

The operational phase of the second follow-up study covered the period from April 1978 through September 1979. Major activities during this period involved data collection, processing and analysis. To facilitate data collection and processing operations, the entire survey was monitored by a computerized control system from the time of first newsletter mailing until an edited machine-readable data base was established. Mailed questionnaire returns were manually edited for completeness and consistency, and returned instruments that failed the initial edit triggered telephone calls to the sample members to clarify or complete the questionnaire responses. Data were then coded into machine-readable form by programmable key-to-tape equipment. Similar procedures were employed for transcript data.

Additional processing of data was accomplished by computer. Data were thoroughly edited (including checks for out-of-range responses, checks for inconsistent responses, and implementation of imputation procedures). Data were subsequently merged into a master data file (which included data from the base-year and first follow-up study). Similar processing procedures were employed for transcript data. Finally, data from the institutional characteristics file were merged with those collected through the second follow-up questionnaire and institutional request surveys and analytic variables and weights were developed.

B. Overview of Quality Control Procedures

RTI was concerned throughout the period of data base construction with the quality of data entered. Quality control of data collected during the second follow-up study occurred at four levels. The first level was an overall data management process implemented through the computerized survey control system. Use of this system considerably reduced errors related to inappropriately identified data (faulty ID numbers). The second level of quality control was a scan-edit of incoming data for completeness and consistency of critical data items, followed by telephone contacts to resolve incomplete or inconsistent responses. The third level of quality control existed at the stage of keying data. Data were keyed through key-to-tape consoles programmed for routine data checks, including: ID number check digit verification, range checks, and consistency checks. Moreover, a 10 percent sample of all data were rekeyed by two additional operators as a check for possible keystroke error. The fourth and final quality control level occurred at the time of entry of data into the computer data file. Machine edit of data involved more sophisticated checks for range and internal consistency as well as consistency checks between data sets (i.e., consistency of questionnaire responses and transcript data, and comparison of information from both of these sources with data obtained previously during the base-year and first follow-up studies).

C. Confidentiality of Project Data

All data collected in the study were maintained under strict control to insure confidentiality of individual data and to maintain data integrity. RTI's Committee for the Protection of Human Subjects reviewed second follow-up planning documents and maintained involvement in all relevant aspects of the survey for the protection of the Institute, USOE, and the study participants.

RTI assumed the responsibility for maintaining all project documents--including questionnaires, transcripts, and data tapes--under strict control to ensure not only confidentiality but also the integrity of various data. During all stages of processing and storage, senior project personnel controlled access to and removal and replacement of all documents from specified working and storage areas.

Second follow-up materials were received in the mail on a daily flow basis and, insofar as possible, were dealt with on a flow basis. Overnight storage of processing batches was in a locked and secure work space. When processing was completed, source doucments were filed in an ordered, accessible manner in a controlled-access storage space.

The name and address file that was necessary for distribution purposes and the substantive data files required for analysis purposes were maintained separately on a strict need-to-know basis throughout the duration of the project. At no time were these files readily accessible except under specific authority of a senior professional working on the project.

II. DATA SOURCES

The data used in the second follow-up study came from six logically separate data sets: (1) an extant Student Master file comprised of data collected or constructed during the base-year and first follow-up studies; (2) the second follow-up survey control file; (3) responses to the second follow-up questionnaire; (4) an institutional characteristics file of 11,010 PSE institutions, developed and provided by USOE;[1] (5) listings of funded Trio programs from 1974 through 1979;[2] and (6) data abstracted from student transcripts, obtained from the PSE institution presently attended or last attended by sample members. Because extant data sources were used, additional instrumentation for the second follow-up study was restricted to the student survey instrument; however, each data source is discussed below.[3]

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[1] See C. D. Carroll, Characteristics of Postsecondary Education Institutions: Computer File Version 7907. USOE Technical Paper 79-12, Washington, D.C.: U.S. Office of Education, June 1979.

[2] See, for example, Johnson, D. D. and Sedorchuk, F. Directory of Funded Projects: Program Year 1978-79 (FY '78 Funds). Washington, D.C.: U.S. Office of Education, October 1978.

[3] See also Burkheimer, G. J., Richardson, J. E., and French, A. M. Data Base Design for the Second Follow-Up Evaluation of the Upward Bound Program. (Report No. RTI/1605/06-04S) Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, October 1979.

A. The Second Follow-up Questionnaire (SFUQ)

The SFUQ was specified and designed by RTI in close collaboration with OED/USOE staff members. In general, the SFUQ was intended to collect data relevant to the student outcome constructs specified in the analysis questions presented in Chapter 1 of this report, with a minimum burden on the respondent in completing and returning the questionnaire. RTI conducted clinical pretests of initial versions of the survey questionnaire, using less than ten students from local PSE institutions. The purpose of these pretests was to investigate various item formats, as well as overall instrument format, for clarity and ease of completion. The questionnaire was revised as necessary, based on reviews of the pretest results by RTI and other interested persons at USOE.

Two forms (A and B) of the SFUQ were developed and designed for self-administration by the respondent. Form A contained 15 items and Form B contained 16 items. The two questionnaire forms were identical in terms of format and content with one exception: Form B contained an additional question concerning extent and pattern of UB participation to supplement the data base where data on this variable were not obtained previously. Thus, Form A was intended for sample members for whom information regarding prior UB participation was available, whereas Form B was intended for those for whom such information was missing.[4]

SFUQ items (on both forms) dealt with factors concerning the individual's current education and work status; educational history (types of schools attended and approximate dates of attendance); educational aspirations and expectations; sources, amounts, and perceived adequacy of financial support; and perceived deterrents to educational attainment. Almost all of the questions on the SFUQ were of the forced-choice (closed-response) type. Open-ended, or free-response, items were limited to questions involving name and location of postsecondary school currently or last attended and to two question s related to financial aid.

Cover letters explaining the purpose of the study and soliciting cooperation, and an instruction sheet providing directions for completing the questionnaires, were also prepared to accompany the instrument on each of several possible mailings. Copies of both forms of the SFUQ, with cover letters and instructions, are included in Appendix D.

B. The Institutional Request Package (IRP)

A major purpose of the second follow-up study was to investigate the impact of the UB program in terms of the PSE performance of former participants. To accomplish this objective, student PSE performance data (i.e., information pertaining to the individual's major field of study, grade point average, credit hours attempted/completed, etc.), as recorded on academic transcripts, were collected from the PSE institutions currently or last attended by sample members. Toward this end, the IRP was developed for mailing to the PSE school currently or last attended by each sample member (as indicated by response on the Second Follow-up Questionnaire).

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[4] By error, Form A was mailed to former participants only and Form B was sent to nonparticipants. When this error was discovered, the UB participation data for former participants who should have received Form B was collected by telephone.

The IRP consisted of a cover letter and several enclosures. The cover letter briefly described the purpose of the study, stressed its importance, informed the administrator that RTI was conducting the survey for USOE, informed the institution of the contractor's rights of access to the information by referencing current Federal privacy legislation (enclosed separately), assured that such legislation would be scrupulously observed, and requested prompt cooperation of the school in this study. The letter further explained what was required of the school and informed the administrator that the standard transcript delivery fee would be paid to the school to offset reproduction and related clerical expenses.

Also included in the IRP were: a computer-generated form containing a complete list of students who indicated attendance at that school and for whom transcripts were requested, with their approximate date of last enrollment; a statement of procedures employed to insure protection of the individual's data; pertinent sections of the current Federal Privacy Regulations; an interpretation of the Regulations, as applicable to this study, by the Office of the General Counsel, HEW; a voucher for reimbursing the school for incurred expenses; a "record of disclosure" for placement in the file of each involved student stating that RTI/USOE had accessed the student's file; and a postage-paid return envelope. A copy of the IRP is included in Appendix D.

C. Other Data

Additional data for the second follow-up were available from the base-year and first follow-up surveys. These data had been incorporated into a student master file, which has been documented separately.[5] The information obtained from this file consisted of encrypted student identification numbers, base-year, and first follow-up sampling parameters (including raw sampling weights), individual response histories for the base-year and first follow-up studies, selected student characteristics and analytic variables determined during the base-year study, and analytic variables and analysis weights developed during the first follow-up study. Major analytic variables extracted from the file were: (a) student classifying information (age, initial grade cohort, extent of prior UB participation, sex, race, academic risk status, poverty status), and (b) prior educational status in fall 1973, spring 1974, fall 1974, and spring 1977.

An extant Institutional Characteristics File was created by USOE. Original plans had called for exclusive use of an earlier version of the institutional file; however, when data became available over 300 identified institutions were not represented on this earlier version. At that time, USOE provided the newly-developed file, which contained sufficient information to compute most of the previously defined institutional indices to be used in this study. Data to complete the Institutional Indices for all schools were obtained, to the extent possible, from extant data of record, and added to the file for identified schools. Some data were imputed, for those cases in which the school name was indicative of certain school characteristics. For important institutional indices, involving the UB host status of institution and Special Services for Disadvantaged Students (SSDS) host status of the institution, data were not provided on the institutional characteristics file; however, these indices were obtained from extant data of record (program directories) and added to the data file. These data had already been encoded for most of the involved schools on the earlier version of an institutional file.

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[5] Research Triangle Institute, Upward Bound Follow-Up Evaluation Analysis File: Standard Codes and Tape Layout (Project 22U-889). Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, September 1977.

III. SURVEY OPERATIONS

This section briefly describes the various operations employed in collecting and processing data for the second follow-up study, as well as the results of those operations. Continued participation of the original sample members in this evaluation study was largely dependent upon RTI's success in locating, motivating, and establishing rapport with these individuals. Materials used by RTI to enhance cooperation and increase response in the second follow-up included newsletters, $2.00 incentive checks, thank you/reminder postcards, and prompting letters. Additional methods involved intensive efforts at tracing sample members to obtain current directory information. The details and results of these data collection activities are presented in this section. Survey operations were monitored by a computerized survey control system, as described in Section IV below.

A. Preliminary Data Collection Activities

Although actual data collection for the second follow-up began in October 1978, preparation for this work began several months earlier. The first major activity involved updating the directory file for all eligible sample members. This file was maintained in a password-protected computer file and contained last known name, address, telephone number, and encrypted ID number for each member of the base-year study sample. An additional access-controlled paper file was maintained for all sample members containing results of previous tracing activities and old addresses.

The base-year study involved a sample of 6,050 UB and comparison students; however, 114 of these original sample members had been classified as ineligible after completion of the first follow-up study due to their inappropriate definition in the initial sampling frame, death, or prior refusal. These ineligibles were excluded from the tracing activities and from the second follow-up survey. Some initial updates to the directory file were made on the basis of address corrections provided by students so late in the first follow-up study that the information had not been previously processed. Major additional activities relating to updating the directory file, involving BHCE/USOE-tracing, newsletter mailings, telephone tracing operations, and additional tracing through Departments of Motor Vehicles, are shown in Figure E.1 and are discussed below.

1. BHCE/USOE Tracing

The initial directory file update effort was conducted by BHCE/USOE. At BHCE/USOE request, RTI generated lists, by project, of last known names, addresses, and telephone numbers of individuals for whom no response to the first follow-up was received or for whom the first follow-up questionnaire was returned by the postal service as undeliverable. BHCE/USOE then forwarded these lists to the directors of the local UB projects with which the sample

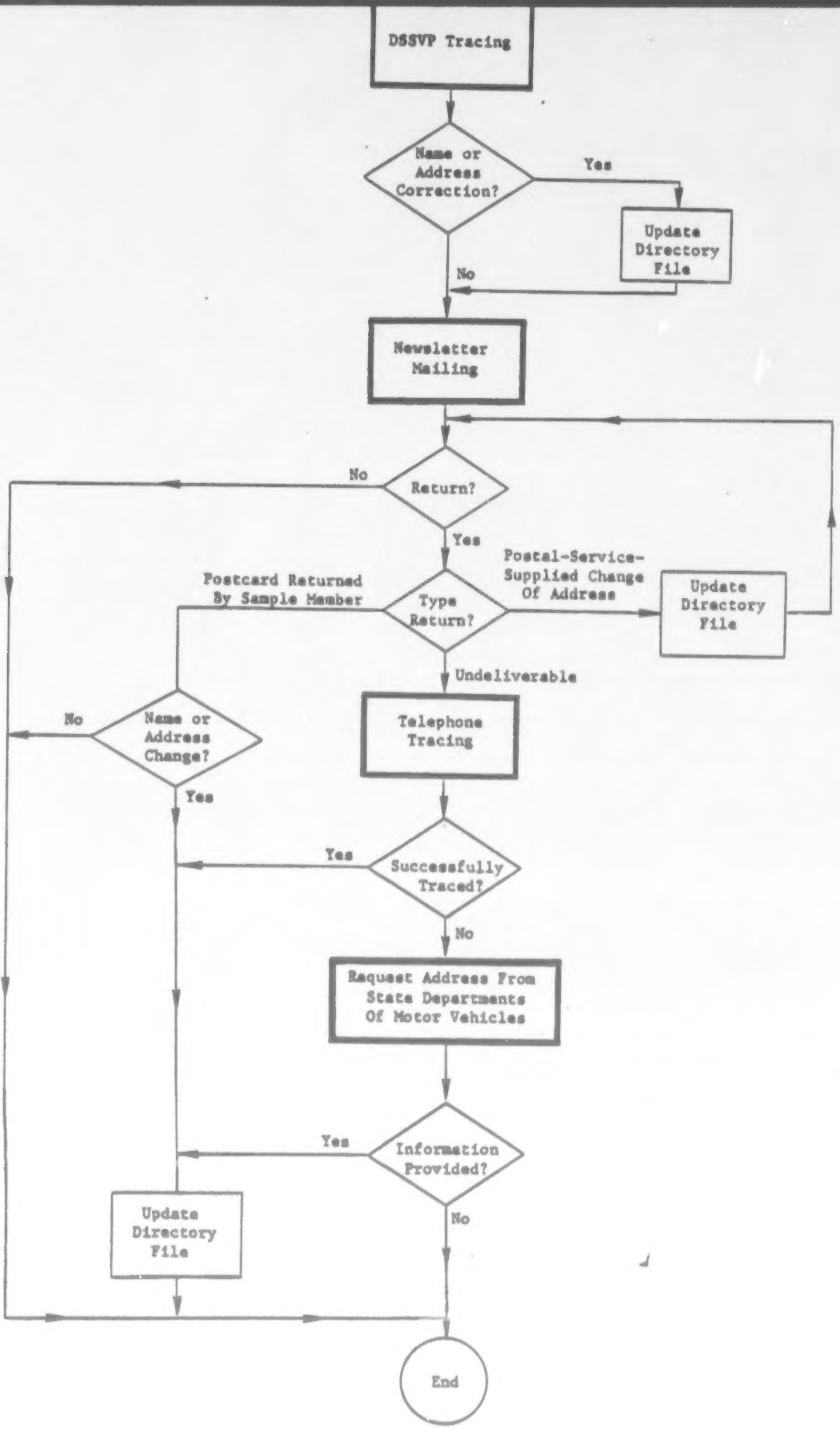
DSSVP Tracing
Name or Address Correction?
Yes
Update Directory File
No
Newsletter Mailing
No
Return?
Yes
Postcard Returned By Sample Member
Type Return?
Postal-Service-Supplied Change Of Address
Update Directory File
Undeliverable
No
Name or Address Change?
Yes
Telephone Tracing
Yes
Successfully Traced?
No
Request Address From State Departments Of Motor Vehicles
Yes
Information Provided?
No
Update Directory File
End

Figure E.1. General flow of tracing activities for the Upward Bound Second Follow-up study.

members had been associated.[6] Project directors were requested by BHCE/USOE to attempt to obtain correct directory information for all listed individuals. Updates received from these projects were entered into the directory file on an as-received basis.

2. Newsletters

As a second directory file update effort, an initial second follow-up activity involved the preparation of two distinct newsletters that were mailed (forwarding address correction requested) to all eligible former UB participants and nonparticipants in the original sample. The two newsletters, one for former UB participants and one for nonparticipants, presented selected results of previous surveys, announced that the second follow-up survey was underway, stressed the importance of continued participation, and requested that the individual return an enclosed postcard verifying or updating his or her name, address, and telephone number.

Experience with the use of an advance newsletter in other large-scale national surveys conducted by RTI had shown this procedure to be extremely useful for initiating tracing activities well ahead of questionnaire mailout as well as for establishing continued rapport with sample members. Copies of both newsletters with accompanying cover letters and return postcard are included in Appendix D. Mailing of newsletters to the last known address of all eligible sample members was begun on 28 April 1978 and continued through 3 July. The extended mailing period included delayed mailings and/or remailings to 563 individuals for whom correct mailing addresses were obtained (through various tracing activities) subsequent to the first mailing. As a result of the various newsletter mailings, 1,774 sample members returned the newsletter postcard either verifying or indicating changes in name and/or address. In addition, the postal service returned 679 newsletters as undeliverable, and these were sent to RTI's telephone tracing department for follow-up action.

3. Telephone Tracing

Telephone tracing procedures were implemented if no current address was available for an individual or as soon as a newsletter was returned by the post office indicating that the mailing address for the individual was no longer correct and that no forwarding address was available. Tracing information types and sources available from the previous surveys were: (a) last known address of respondent; (b) name, address, and telephone number of parents, guardians, or relatives; (c) name and location of the high school or post-secondary school the individual attended; (d) UB project (if applicable); and (e) neighbors or friends of the individual. Receipt of initial directory information changes and tracing of undeliverables continued through September 1978. As new addresses were obtained from tracing activities, returned mail, or other sources, the computer directory file of names and addresses was updated. If this information had been obtained prior to 3 July, a newsletter was mailed to the individual.

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[6] Nonparticipants were also associated uniquely with one and only one UB project by virtue of being associated with a high school served by the project.

4. Additional Tracing

After previous tracing activities, there still remained 357 cases for whom no current address or only an incorrect (undeliverable) address was available. It was jointly determined by RTI and OED that one additional attempt would be made to obtain current addresses for these individuals. That attempt was made through the Department of Motor Vehicles in the state of last known residence for the 170 individuals for whom necessary information to initiate such tracing (e.g., birth date and/or social security number) was available. This additional tracing was initiated on 3 August 1979, and resulted in updated addresses for 56 individuals.

5. Overall Tracing Results

As a result of the various tracing activities, more current name and address information was obtained for 1,622 individuals. (An additional 935 individuals verified that the current name and address information maintained in the RTI directory file was correct.) Of these cases, 839 represented return of the postcard included with the newsletter, 613 represented cases resolved through one of the tracing activities (DSSVP, telephone, and Departments of Motor Vehicles), and 170 represented only a postal-service-supplied change of address. Further, as a result of the various tracing activities 9 sample members were identified as deceased or otherwise incapacitated.

B. Student Survey

The student survey consisted of several stages, including an initial mailing of the SFUQ, a second mailing to nonrespondents to the first mailing, remailings to traceable cases for whom the first or second mailing was returned as undeliverable, and telephone interviews of a subsample of nonrespondents and undeliverables. The general nature of this data collection effort is shown in Figure E.2 and discussed more thoroughly in the following subsections.

1. Mail Questionnaire Survey

As noted earlier, 114 of the original 6,050 student sample members selected for participation in the base-year study had been classified as ineligible for further study after completion of the first follow-up survey. Additionally, the 9 sample members determined to be deceased during tracing were classified as ineligible. Another group of 53 individuals was not included in the mailing, since their address had never been determined. Thus, only 5,874 sample members were involved in the survey. The initial packet of survey materials was mailed on 10 October 1978, and included a SFUQ with instructions, a cover letter from the Deputy Commissioner of the Bureau of Higher and Continuing Education, and a $2.00 incentive check. One week later, thank-you/reminder postcards were mailed to these same individuals as a prompting for questionnaire return. Mail returns consisted of (a) packages returned by the postal service as undeliverable, (b) postal-service-supplied forwarding addresses, and (c) completed or partially completed questionnaires. As returns arrived, they were event coded for entry into the survey control system, name and/or address corrections were made in the directory file, and telephone tracing activities were initiated for undeliverable cases.

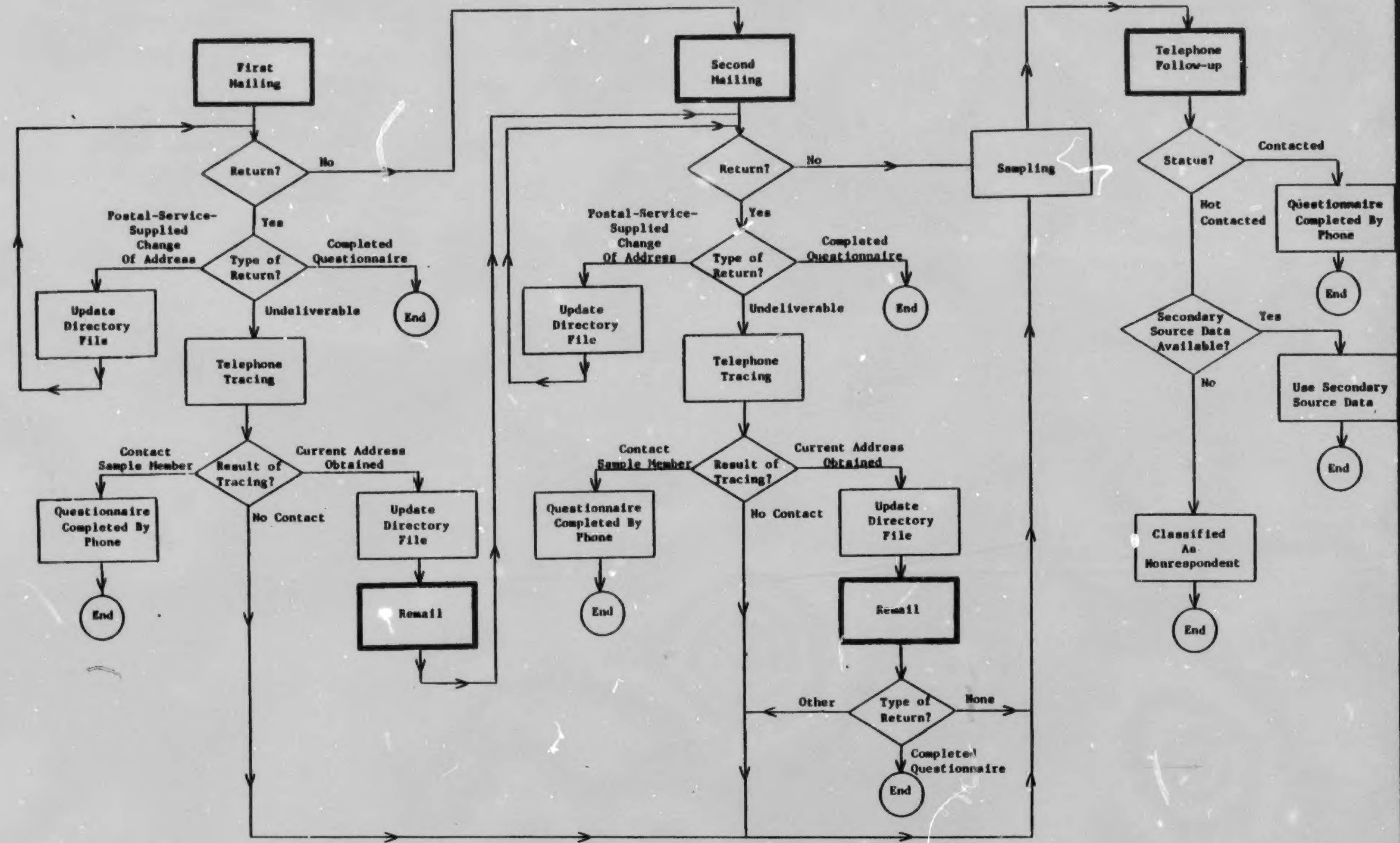
First Mailing
Return?
No
Yes
Postal-Service-Supplied Change Of Address
Type of Return?
Completed Questionnaire
End
Update Directory File
Undeliverable
Telephone Tracing
Contact Sample Member
Result of Tracing?
Current Address Obtained
No Contact
Questionnaire Completed By Phone
End
Update Directory File
Remail
Second Mailing
Return?
No
Yes
Postal-Service-Supplied Change Of Address
Type of Return?
Completed Questionnaire
End
Update Directory File
Undeliverable
Telephone Tracing
Contact Sample Member
Result of Tracing?
Current Address Obtained
No Contact
Questionnaire Completed By Phone
End
Update Directory File
Remail
Other
Type of Return?
None
Completed Questionnaire
End
Sampling
Telephone Follow-up
Status?
Contacted
Not Contacted
Questionnaire Completed By Phone
End
Secondary Source Data Available?
Yes
No
Use Secondary Source Data
End
Classified As Nonrespondent
End

Figure E.2. General flow of student questionnaire data collection activities for the Upward Bound Second Follow-up study.

On 6 November a second questionnaire packet--containing the same materials as the first, except for the $2.00 incentive check, plus a prompting letter from the RTI project director--was mailed to 3,744 nonrespondents to the first mailing. "Remailings" were conducted on 10 November and 6 December for sample members whose first or second questionnaire packet had been returned as undeliverable but who had been subsequently traced. These remailings consisted of the same materials included in the first mailing, along with a special explanatory letter from the RTI project director. Each of these mailings was followed one week later by a thank-you/reminder postcards to those individuals. Materials included in the several mailings are included in Appendix D.

Returns to the various mailings and remailings continued to arrive at RTI through February 1979. A total of 3,005 questionnaires were received from the 5,874 eligible sample members involved in the mail survey (excluding those who returned questionnaires and were also selected into the telephone interview sample), for a 51.2 percent mail return rate.

2. Telephone Interviews

The second follow-up study design incorporated a telephone follow-up survey of those individuals who had not responded to the mail questionnaire by 3 January 1979. It had been anticipated that mail respondents would differ from nonrespondents in terms of the outcome measures being assessed by the study, and coverage of this segment of the original sample was considered quite important. Since cost considerations precluded contacting all mail nonrespondents, a stratified subsample of 1,500 mail nonrespondents was selected for telephone follow-up.

Based on suspected biases, expected standard errors, analytic appropriateness, and expected costs, an optimal (or near optimal) sampling procedure was determined jointly by RTI and USOE. Individuals who had been classified as "hard core" undeliverables (N = 308) were not included in the sampling frame; they were considered lost to the study, and their weights were appropriately redistributed (see Appendix G). Ten strata were defined by the sampling frame, based on a partial crossing of: types of nonresponse (undeliverable or simply unreturned questionnaires), availability of first follow-up data (available or not available), and prior indication of PSE entry (previously indicated entry, previously indicated no entry, no previous indication). Differential sampling rates were established within each strata with higher rates being assigned primarily to prior PSE entry (in keeping with the major objectives of the study) and to simple nonrespondents (due to heavy cost factors estimated for contacting undeliverables). Since no serious response rate differences were indicated among other categories of interest (i.e., former participation status, initial grade cohort, UB project membership, race, sex, poverty status, or risk status), these categories were not used to define formal strata; however, the sampling procedure used (systematic selection) did take these factors into account to assure stochastic representation among the various categories. The sampling procedure thus ensured that all eligible sample members (excluding the "hard core" undeliverables) had a positive probability of representation in the final data set. A more detailed statement of the sampling design employed for selecting nonrespondents to the mail survey is presented in Appendix C.

Telephone tracing and interviewing of those selected occurred from 11 January through 16 February, and involved attempts to locate the previous nonrespondents and to collect, by telephone, the basic information on the SFUQ. During the tracing process, questionnaire information about the sample member was solicited from family members and other secondary sources. Any information so collected was used if the sample member could not be personally contacted; however, obtaining these secondary source data in no way restricted further attempts to contact the sample member.

To eliminate unnecessary expense and unnecessary contact with sample members or their families, mail returns were checked against current lists of telephone interview completions; and, if a mail return was received for a sampled individual prior to completing telephone interview procedures, subsequent telephone activities for that person were suspended. Some mail returns were not received in time to avoid duplication of data collection efforts, but a substantial number were received prior to telephone interview. Of the 1,500 individuals selected for telephone interview, information was collected (from primary or secondary sources) on 1,259, for an overall telephone completion rate of about 84 percent.

3. Overall Survey Return Rates

Information was obtained for 4,264 of the 5,874 individuals included in the second follow-up survey (3,005 mail returns and 1,259 telephone interviews), for a total survey response rate of about 73 percent. Sample coverage was considerably higher (88 percent) due to the high contact rate among the mail nonrespondents subsampled for telephone interviews. Coverage rate is still low, however, since it reflects the fact that "hard core" undeliverables (N = 308) were not included in the telephone interview sampling frame. Final return rates for the various data collection efforts (mail and telephone surveys) are given in Table E.1.

Final data availability in relation to the major study classifiers (UB participation and initial grade-level cohort) is given in Table E.2. The values presented in Table E.2 indicate some differential data availability. In general, data availability was slightly greater for the former UB participant group than for nonparticipants. Differences in data availability among the three grade cohorts were larger and were systematically increasing over the three grades considered.

Sample coverage was sufficiently complete to assure that any biases in the findings, due to peculiarities of the nonresponding group, would be relatively small. The greater availability of data for former participants, however, raises the possibility that those individuals representing former participant nonrespondents are in some way systematically different from those representing the nonparticipant nonrespondents. Cohort nonresponse differences also may have led to some distortion of results, although this variable was typically controlled in analysis. Similarly, the lower completion rate of telephone interviews among sample members for whom current addresses were not available may also have distorted the results. Statistical adjustment techniques were applied in an attempt to correct for any biases that may have been introduced by differential data availability (see Appendixes G and H).

Table E.1

FINAL RESPONSE RATES FOR THE UPWARD BOUND SECOND FOLLOW-UP STUDY

Group	Number	Percent of Eligibles
Ineligibles	123	--
Nonrespondents[a]	1,660	28.0%
Respondents		
Mail 1 (M1) only	2,388	40.3%
Mail 2 (M2) only	532	9.0%
Telephone (T) only	1,243	21.0%
M1 and M2	86	1.5%
M1 and T	10	0.2%
M2 and T	7	0.1%
M1, M2, and T	1	0.0%
Total Respondents	4,267	72.0%
Total Eligibles	5,927	100.0%
Total	6,050	

NOTE: A total of 11 individuals represented as mail respondents represent cases, for which data was collected by telephone during tracing. Three deceased sample members are reported as respondents. Telephone response rates include 393 secondary source responses.

[a] Includes all "undeliverables," including "hard core" cases.

C. Institutional Requests Data Collection

As noted earlier, second follow-up data collection also involved a separate request for transcripts from PSE institutions most recently attended by those sample members who reported PSE attendance. Of the 4,264 eligible sample members responding (mail and telephone) to the Second Follow-up Questionnaire, 3,090 indicated current or prior PSE attendance at 999 different institutions. Of these, academic transcripts were requested for only 2,656 individuals at 873 PSE institutions. Transcripts were not requested for the remaining 434 sample members for the following reasons: (1) the respondent explicitly refused to grant permission to access his or her transcript data (N = 259); (2) the PSE institution last attended was not identified (N = 68); or, (3) no current mailing address could be established for the PSE institution identified (N = 107).

Table E.2

DATA AVAILABILITY WITH RESPECT TO PRIOR UPWARD BOUND
PARTICIPATION STATUS AND ORIGINAL GRADE COHORT

Fall 1973 Grade Level[a]	Upward Bound Participant Status[b]			
	Prior Participant		Nonparticipant	
	Number of Cases[c]	Data Available[d]	Number of Cases[c]	Data Available[d]
10	552	366 (66.3%)	764	515 (67.4%)
11	1,393	1,037 (74.4%)	770	518 (67.3%)
12	1,675	1,265 (75.5%)	770	563 (73.1%)
TOTAL	3,620	2,668 (73.7%)	2,304	1,596 (69.3%)

[a] Classification used is best estimate of original grade cohort.

[b] Classification used is that used for original sampling.

[c] The 126 cases who were ineligible for the survey or who were reported to be deceased are not included in these counts.

[d] Percentages expressed are relative to number of cases in the specific cell.

The survey plan had called for mailing of institutional request packages to all PSE institutions simultaneously. However, due to problems in identifying a number of the institutions involved at the scheduled mailing time, the transcript request survey was conducted in two waves. More specifically, 331 PSE institutions (representing 433 students) were unidentifiable through any of the available directories at the scheduled mailout date. To avoid jeopardizing the overall project schedule, it was decided that further efforts would be made to identify as many of the unidentified schools as possible and to make transcript requests of those identified subsequently. These efforts were successful in appropriately identifying and/or obtaining directory information for 239 of the previously unidentified schools (representing 326 students). On the other hand, addresses could not be obtained for 92 PSE institutions and, therefore, it was not possible to initiate transcript requests for the 107 sample members who had reported current or last attendance at these schools.

On 16 March, the first-wave mailing of transcript request packages was sent to 634 postsecondary institutions. Two weeks later, on 19 March, mailings were made to the 239 institutions in the second wave. Copies of materials included in the transcript request package (first and second waves) are included in Appendix D.

Responses to the transcript requests continued to arrive at RTI through May. These responses were routinely logged (by both student and institution), event coded, batched, and entered into the survey control system. Vouchers for payment to institutions for transcripts were processed as received to facilitate timely payment. Receipt of mail and telephone inquiries from schools were handled individually on an as-received basis. Most of these inquiries were either to clarify transcript release policy or to seek additional identifying information (e.g., social security number) on students for whom transcripts had been requested.

Telephone follow-up activities were intiated on 16 April to 194 institutions that had not responded to the first-wave transcript request mailing, and on 3 May to 72 nonresponding institutions in the second-wave mailing. The purpose of these contacts was: (1) to determine if the institution had recieved the request, (2) if so, to urge early response, and (3) if not, to obtain the name of an individual to whom a second package could be mailed. Remailing of institutional request packages to specified individuals in the latter schools was initiated on 30 April and 16 May.

Responses (either partial or complete) were received from 817 (over 93 percent) of the institutions requested and transcripts were received for 2,310 sample members (87 percent of those requested). An additional 190 sample members at 127 of those institutions (about 7 percent) were reported as never having been enrolled in the school.

IV. THE SURVEY SUPPORT SYSTEM

Survey support includes a broad range of management activities directed toward providing control and aid to other survey operations. The basic survey support tasks were: (a) directory file maintenance, (b) sample selection, (c) mailing label production, (d) receipt control, (e) data processing and management, and (f) periodic status reporting. Although these tasks may be accomplished manually, it was felt that, in order to produce a high quality survey, a computerized system was necessary.

RTI's experience suggests that the daily operations of a survey are best monitored by a combination of automated and manual processes. The entire second follow-up survey was monitored by such a support system from time of first newsletter mailing until all data had been collected and an edited machine-readable data base was established. Figure E.3 shows the data sources that were inputs to the computerized survey support system, the products that were its outputs, and the interrelations among the various data sets. As can be seen, the logic underlying this control system was that all operations should pass through a central computer-controlled process prior to any further action and that the central process should verify, edit, validate, and schedule activities using the totality of information available at any given time. Table E.3 lists the basic operations performed by the survey control system.

The survey control system was designed to respond to the occurrence of events and to monitor the sequence and relationship of events as they occur over time. Monitored events included mailout of materials (newsletters, questionnaires, transcript requests), nonrespondent sample selection, execution of telephone interviews, receipt control, and data entry and editing. In general, this system maintained data that reflected the current survey status

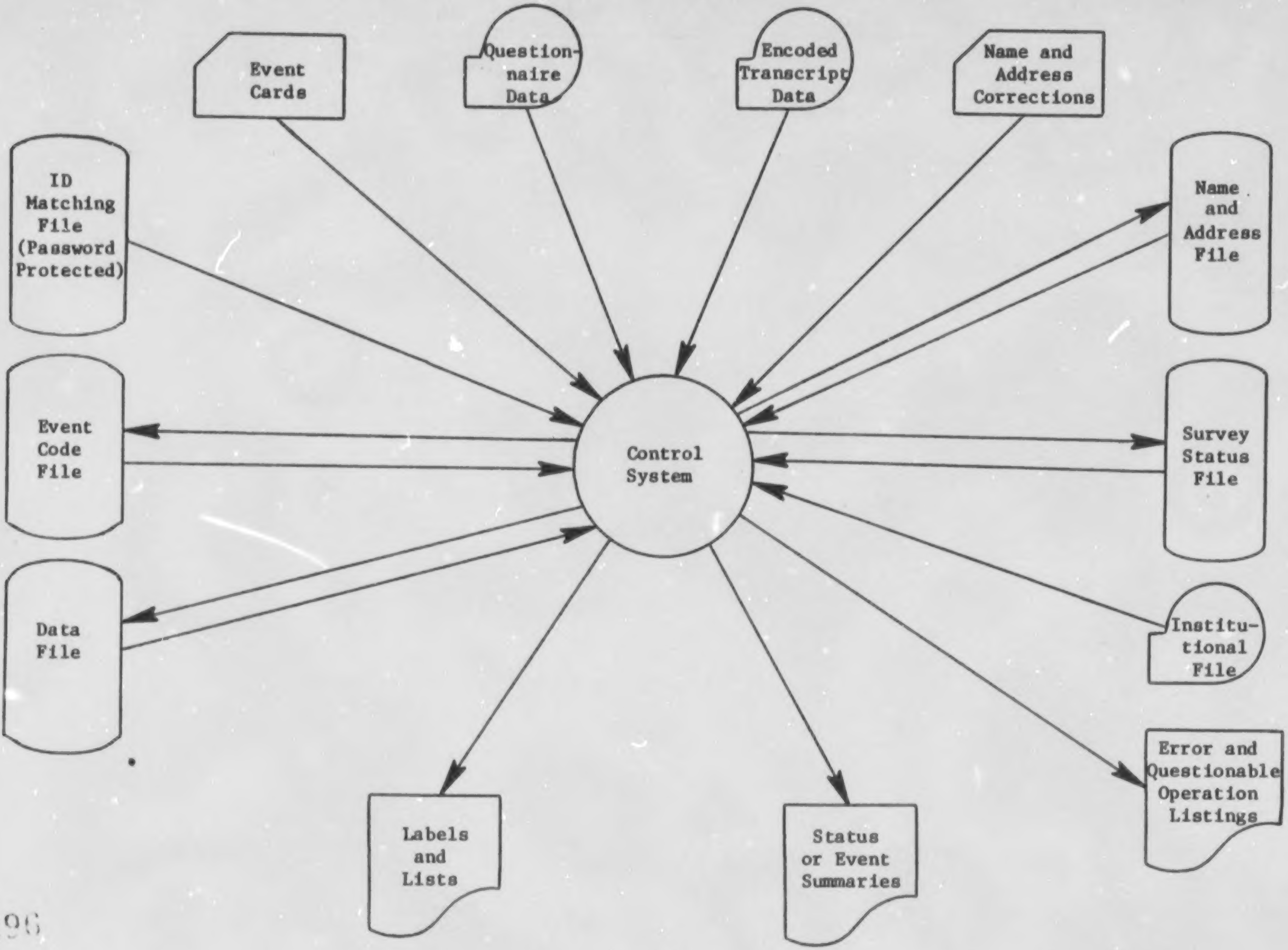
Event Cards
Question-naire Data
Encoded Transcript Data
Name and Address Corrections
ID Matching File (Password Protected)
Name and Address File
Event Code File
Control System
Survey Status File
Data File
Institu-tional File
Error and Questionable Operation Listings
Labels and Lists
Status or Event Summaries

Figure E.3 Study data set elements in relation to survey control system.

Table E.3

BASIC OPERATIONS PERFORMED BY SURVEY CONTROL SYSTEM

Operation	Input Data Sets	Output Operations
1. Generate Student Mailing Labels	Name and Address File ID Matching File Survey Status File	Print List and Mailing Labels Update Survey Status File Update Event Code File
2. Process Events	Event Cards ID Matching File Survey Status File	Print Event Errors (Not Processed) Print Questionable Events Update Survey Status File Update Event Code File
3. Update Addresses	Name and Address Correction Cards ID Matching File Survey Status File	Print Attempted Illegal Update (Not Processed) Update Name and Address File Update Survey Status File Update Event Code File
4. Sample for Telephone Interview	Name and Address File ID Matching File Survey Status File	Print Lists and Labels Update Survey Status File Update Event Code File
5. Produce Status Summaries	Survey Status File	Print Summary
6. Produce Event Summaries	Event Code File	Print Summary
7. Edit and Enter Questionnaire Data	Questionnaire Data ID Matching File Survey Status File Data File	Print Attempted Illegal Entry (Not Processed) Print Fail Edit Listing Enter Edited Data in Data File Update Survey Status File Update Event Code File
8. Generate Labels, Records of Disclosure, and Lists for Transcript Request	Data File Institutional File ID Matching File	Print School Label Print by Institution List of Students Attending Print by Institution Associated Student Names on Records of Disclosure Update Survey Status File Update Event Code File

(continued)

Table E.3

(continued)

Operation	Input Data Sets	Output Operations
9. Edit and Enter Transcript Data	Encoded Transcript Data ID Matching File Survey Status File Data File	Print Attempted Illegal Entry (Not Processed) Print Fail Edit Listing Enter Edited Data in Data File Update Survey Status File Update Event Code File
10. Add Institutional Data	Institutional File Data File ID Matching File	Match Institutional Data and Enter in Data File

of each sample member (survey status file), as well as useful historical information describing the sample member's sequencing through each defined survey event (event code file). In addition to monitoring the survey activities, the system could provide, on request, statistics on each of the operational categories determined by the events that had been defined (e.g., current response status).

To be effective, the system required timely input for each event that took place; therefore, as any of the events occurred for an individual, the event was manually coded and entered into the computerized survey control system on an event card containing the individual's unique ID number. Some events were computer-generated (e.g., selection of an individual for telephone interview); in such cases, the occurrence of the event was entered directly into the system at the time it was generated. In any case, since this processing was performed on a flow basis, the events were reflected in the system within a few days of their occurrence. The specific events in this survey are listed in Table E.4. For each event a specific set of procedures was applied and the survey status file was appropriately updated to allow quantitative monitoring of events and accurate processing of subsequent events.

As events occurred, a card file of pending events was accumulated. A computer program processed the event cards to update the survey status vector of any individual involved in the survey. An individual's status vector contained each of the 19 elements defined in Table E.5. There were 6,050 such vectors, one for each sample member.

In addition to providing a complete and accurate record of survey progress, the support system allowed rigorous quality control of data receipt and management activities through a series of internal checks. Such checks involved accessing an individual's current status prior to performing various data entry operations, which considerably reduced the likelihood of entering data for the wrong individual and virtually eliminated the problem of duplicate record entry. Event records consisted of student ID, check digit, and

Table E.4

MONITORED SECOND FOLLOW-UP SURVEY EVENTS

Event Number	Description	Condition Generating Event
1[a]	Presurvey Address Update	Address update processed prior to newsletter mailing
2[a]	First Wave Newsletter Mailed	Label generated for student for first wave newsletter mailing
3[a]	Delayed Newsletter Mailed	Newsletter tracing update made, leading to label generation, and newsletter previously not mailed
4[a]	Newsletter Remailed	Newsletter tracing update made, leading to label generation, and newsletter previously mailed
5	Undeliverable Newsletter	Newsletter returned undeliverable
6	Return of Newsletter Postcard	Newsletter postcard returned, no indication of "deceased"
7	Newsletter Indicates Deceased	Newsletter package or postcard returned with indication that sample member is deceased
8[a]	Newsletter Address Update, P.O.	Newsletter address update processed containing code indicating update is Post Office supplied
9[a]	Newsletter Address Update, Tracing	Newsletter address update processed containing code indicating update is from tracing
10[a]	Newsletter Address Update, Student	Newsletter address update processed containing code indicating update is from returned postcard
11[a]	First Questionnaire Mailed	Label generated for first questionnaire mailout
12	First Questionnaire Undeliverable	First questionnaire mailout returned undeliverable
13	Return of First Questionnaire	First questionnaire returned, no indication of "deceased"
14	First Mailing Indicates Deceased	First questionnaire mailout returned, with indication that sample member is deceased
15	Check Cashed	Notification received that check has been cashed

(continued)

Table E.4

(continued)

Event Number	Description	Condition Generating Event
16[a/]	Second Questionnaire Mailed	Label generated for second questionnaire mailout
17	Second Questionnaire Undeliverable	Second questionnaire mailout returned undeliverable
18	Return of Second Questionnaire	Second questionnaire returned, no indication of "deceased"
19	Second Mailing Indicates Deceased	Second questionnaire mailout returned with indication that sample member is deceased
20[a/]	Data Collection Address Update, P.O.	Data collection update processed containing code indicating update is post office supplied
21[a/]	Data Collection Address Update, Tracing	Data collection update processed containing code indicating update is from tracing
22	Questionnaire Fails Edit	Returned questionnaire fails edit
23	Fail Edit Resolved	Previous fail edit questionnaire resolved
24[a/]	Sampled for Phone F.U.	Label generated for telephone interview
25	Phone Information From Secondary Source Only	Telephone interviewing completed, only secondary source data obtained
26	Phone Information From Sample Member	Telephone interviewing complete, sample member contacted and information obtained from him/her
27	Phone Information Indicates Deceased	Telephone interviewing terminated, sample member reported dead
28[a/]	First Questionnaire Mailing Data Entry	Questionnaire data entered with code indicating first mailing
29[a/]	Second Questionnaire Mailing Data Entry	Questionnaire data entered with code indicating second mailing
30[a/]	Telephone Interview Data Entry	Questionnaire data entered with code indicating telephone
31[a/]	Unidentifiable PSE Institution	Questionnaire data indicate PSE institution cannot be identified

(continued)

Table E.4
(continued)

Event Number	Description	Condition Generating Event
32[a]	Student Refuses Transcript Access	Questionnaire data indicate identifiable PSE institution and transcript refusal
33[a]	Student Does Not Refuse Transcript Access	Questionnaire data indicate identifiable PSE institution and no refusal
34[a]	Transcript Request Mailed	Student name printed on a student listing form
35	Transcript Received	Student transcript data received
36[a]	Transcript Data Entry	Transcript Data Entered onto Data File
37	Special Tracing Update During Newsletter Operation	Special purpose tracing update required during newsletter tracing operations
38	Terminal Fail Edit (Refusal)	Questionnaire returned indicating complete refusal of sample member to
39[a]	Remailing of Questionnaire	Previously undeliverable questionnaire remailed after obtaining tracing update
40	Data Collected During Tracing	Tracing operations unable to locate individual but obtained information from secondary source by telephone
41[a]	Data Entry, Remailing	Questionnaire data entered with code indicating remailing
42[a]	Data Entry, Combined Form	Questionnaire data entered with code indicating combined form
43[a]	Data Entry, Tracing Only	Questionnaire data entered with code indicating secondary source data collected during tracing

[a] These events were generated by computer.

Table E.5

ELEMENTS OF A SAMPLE MEMBER'S SURVEY STATUS VECTOR

Element Number	Status Code Name	Valid Codes
1	Labeling Code	0 = UB, Form A 1 = UB, Form B 2 = CS, Form A 3 = CS, Form B
2	Second Follow-Up Eligibility	0 = Not Eligible 1 = Eligible, No Address 2 = Eligible, With Address
3	Newsletter Mailing	0 = Not Mailed 1 = Mailed, First Wave 2 = Delayed Mail 3 = Remailed
4	Newsletter Response	0 = None 1 = Returned Undeliverable 2 = Post Card Returned 3 = Dead
5	Newsletter Address Update	0 = None 1 = P.O. Supplied Forwarding Address 2 = Tracing Update 3 = Student Supplied Update
6	Questionnaire Mailout 1	0 = Not Mailed 1 = Mailed
7	M1 Response	0 = None 1 = Returned Undeliverable 2 = Questionnaire Returned 3 = Dead
8	Check Cashed	0 = No 1 = Yes
9	Questionnaire Mailout 2	0 = Not Mailed 1 = Mailed 2 = Remailed Undeliverable
10	M2 or Remail Response	0 = None 1 = Returned Undeliverable 2 = Questionnaire Returned 3 = Dead

(continued)

Table E.5
(continued)

Element Number	Status Code Name	Valid Codes
11	Data Collection Address Update	0 = None 1 = P.O. Supplied Forwarding Address 2 = Tracing Update 3 = Data Collected During Tracing
12	Fail Edit Code	0 = No Fail Edit Problems 1 = Fail Edit 2 = Edit Resolution 3 = Terminal Fail Edit (Refusal)
13	Telephone Sample Selection	0 = No Selected 1 = Selected
14	Telephone Contact	0 = No Information 1 = Secondary Source Information 2 = Primary Source Information 3 = Dead
15	Data Entry	0 = None 1 = M1 2 = M2 3 = Remailing 4 = T 5 = Combined 6 = Tracing Only
16	Transcript Permission	0 = No PSE or Indeterminate 1 = PSE Not Identified 2 = PSE Identified, Refusal 3 = PSE Identified, No Refusal
17	Transcript Request Mailed	0 = No 1 = Yes
18	Transcript Received	0 = No 1 = Yes 2 = Unknown at Institution
19	Transcript Data Entry	0 = No 1 = Yes

event number (1-43). In processing any event record, certain checks were performed. As a result of the internal checks, one of three mutually exclusive events occurred:

(1) Change of status vector elements, S(2) through S(19),[7]

(2) Printing of ID number, event number, and status vectors for the individual, with no further action taken on the event, or

(3) Printing of an error message with no further action taken on the event.

These actions represented three error conditions: no error suspected, error suspected or unusual circumstance, and definite error, respectively. The specific checks performed are given in Table E.6.

V. PREMACHINE (MANUAL) PROCESSING OF RETURNED DATA

The steps of preliminary processing of returned data were directed toward ensuring quality data preparation from the returned questionnaires. Most of this preliminary processing of returned questionnaires and transcripts was performed manually. Second follow-up questionnaires and transcripts returned by mail were checked-in by identification numbers on the day they were received, batched for document control purposes, and forwarded to the manual coding/editing staff.

A. Questionnaire Processing

An initial step in premachine processing consisted of a manual scan-edit to see if each returned questionnaire contained a minimum set of key item data. This procedure was completed as soon as possible after receipt (and event-coding of that receipt) and involved only a subset of the questionnaire items with particular emphasis on skip pattern failure and items addressing important study constructs. A specification of these edit rules is provided in Table E.7. Questionnaires that failed the key-item edit were separately batched and routed to the telephone follow-up staff for contact with the respondents to resolve omissions or inconsistencies related to these items, prior to additional coding/editing.

The initial scan-edit (and resolution, if required) was followed by a more comprehensive edit and coding of all items of the questionnaire. Stray pencil marks were erased and intended responses were distinguished from crossed-out responses by colored pencil. Standard alphabetic error codes were used for major item indeterminacy problems, as indicated in Table E.8. Other manual coding was minimal due to the predominantly self-coding nature of the questionnaire, and involved simply assigning Federal Interagency Committee on Education (FICE) or other unique codes to the current or last attended PSE institutions reported by respondents. Specifications for the second stage of questionnaire editing/coding are provided in Table E.9. It should be noted that imputations were performed in this level of edit.

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[7] Status vector element S(1) was not changed once it was assigned an initial value.

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Table E.6

EVENT PROCESSING STEPS FOR SECOND FOLLOW-UP STUDY

<u>Event 1: Pre-Survey Address Update</u>

```
     IF(S(2).EQ.0), THEN ERROR;
     OTHERWISE, IF(S(2).EQ.2), THEN PRINT;
             OTHERWISE, S(2) ← 2.
```

<u>Event 2: First Wave Newsletter Mailing</u>

```
     IF((S(2).LE.1).OR.(S(3).NE.0)), THEN ERROR;
     OTHERWISE, S(3) ← 1.
```

<u>Event 3: Delayed Newsletter Mailing</u>

```
     IF((S(2).NE.1).OR.(S(5).NE.2)), THEN ERROR;
     OTHERWISE, IF(S(3).NE.0), THEN ERROR;
             OTHERWISE, S(3) ← 2.
```

<u>Event 4: Remailed Newsletter</u>

```
     IF((S(3).EQ.0).OR.(S(5).NE.2)), THEN ERROR;
     OTHERWISE, IF((S(3).EQ.2).OR.(S(3).EQ.3).OR.(S(4).GE.2)), THEN PRINT;
             OTHERWISE, S(3) ← 3.
```

<u>Event 5: Undeliverable Newsletter</u>

```
     IF(S(3).EQ.0), THEN ERROR;
     IF(S(3).EQ.3), THEN PRINT;
     IF((S(3).EQ.1).OR.(S(3).EQ.2),
         THEN IF(S(4).NE.0), THEN ERROR;
             OTHERWISE, S(4) ← 1.
```

<u>Event 6: Returned Newsletter Postcard</u>

```
     IF(S(3).EQ.0), THEN ERROR;
     IF((S(3).EQ.1).OR.(S(3).EQ.2);
         THEN IF(S(4).NE.0), THEN ERROR;
             OTHERWISE, S(4) ← 2;
     IF(S(3).EQ.3),
         THEN IF(S(4).EQ.1), THEN S(4) ← 2,
             OTHERWISE, PRINT.
```

(continued)

Table E.6

(continued)

Event 7: Deceased, Newsletter

```
IF(S(3).EQ.0), THEN ERROR;
IF(S(3).EQ.3), THEN PRINT;
IF((S(3).EQ.1).OR.(S(3).EQ.2)),
     THEN IF(S(4).NE.0)), THEN ERROR;
          OTHERWISE, S(4) ← 3.
```

Event 8: Newsletter Address Update, P.O.

```
IF(S(3).EQ.0), THEN ERROR;
OTHERWISE, IF(S(5).EQ.0), THEN S(5) ← 1;
          OTHERWISE, PRINT.
```

Event 9: Newsletter Address Update, Tracing

```
IF(S(5).LE.1), THEN S(5) ← 2;
OTHERWISE, PRINT.
```

Event 10: Newsletter Address Update, Student

```
IF((S(3).EQ.0).OR.(S(4).NE.0)), THEN ERROR;
OTHERWISE, IF(S(5).EQ.3), THEN PRINT;
          OTHERWISE, S(5) ← 3, AND
                     S(4) ← 2.
```

Event 11: Mailing #1

```
IF((S(6).NE.0).OR.(S(4).EQ.3)), THEN ERROR;
OTHERWISE, IF((S(2).EQ.1).AND.(S(5).EQ.0)), THEN ERROR;
          OTHERWISE, S(6) ← 1.
```

Event 12: M1 Undeliverable

```
IF((S(6).EQ.0).OR.(S(7).NE.0)), THEN ERROR;
OTHERWISE, S(7) ← 1.
```

Event 13: M1 Returned

```
IF((S(6).EQ.0).OR.(S(7).NE.0)), THEN ERROR;
OTHERWISE, S(7) ← 2.
```

Event 14: Deceased, M1

```
IF((S(6).EQ.0).OR.(S(7).NE.0)), THEN ERROR;
OTHERWISE, S(7) ← 3.
```

(continued)

Table E.6

(continued)

Event 15: Check Cashed

```
IF((S(6).EQ.0).AND.(S(9).EQ.0), THEN ERROR;
OTHERWISE, IF(S(8).NE.0), THEN ERROR;
          OTHERWISE, IF(S(6).EQ.0), THEN PRINT;
                    OTHERWISE, S(8) ← 1.
```

Event 16: Mailing #2

```
IF((S(9).NE.0).OR.(S(6).EQ.0).OR.(S(7).GE.1)), THEN ERROR;
OTHERWISE, S(9) ← 1.
```

Event 17: M2 or Remail Undeliverable

```
IF((S(9).EQ.0).OR.(S(10).NE.0)), THEN ERROR;
OTHERWISE, S(10) ← 1.
```

Event 18: M2 or Remail Returned

```
IF((S(9).EQ.0).OR.(S(10).NE.0)), THEN ERROR;
OTHERWISE, S(10) ← 2.
```

Event 19: Deceased, M2 or Remail

```
IF((S(9).EQ.0).OR.(S(10.NE.0)), THEN ERROR;
OTHERWISE, S(10) ← 3.
```

Event 20: Data Collection Address Update, P.O.

```
IF((S(6).EQ.0).AND.(S(9).EQ.0)), THEN ERROR;
OTHERWISE, IF(S(11).EQ.0), THEN S(11) ← 1,
          OTHERWISE, PRINT.
```

Event 21: Data Collection Address Update, Tracing

```
IF((S(11).LE.1), THEN S(11) ← 2;
          OTHERWISE, PRINT.
```

Event 22: Fail Edit

```
IF((S(7).NE.2).AND.(S(10).NE.2).AND.(S(11).NE.3).AND.((S(14).EQ.0)
               .OR.(S(14).EQ.3))), THEN ERROR;
OTHERWISE, IF(S(12).NE.0), THEN ERROR;
          OTHERWISE, S(12) ← 1.
```

(continued)

Table E.6

(continued)

Event 23: Edit Resolution

```
IF((S(12).EQ.0).OR.(S(12).EQ.3)), THEN ERROR;
IF(S(12).EQ.2), THEN PRINT;
OTHERWISE, S(12) ← 2.
```

Event 24: Sampled for Telephone Interview

```
IF((S(7).GE.2).OR.(S(10).GE.2).OR.(S(11).EQ.3).OR.(S(4).EQ.3)), THEN ERROR;
OTHERWISE, IF(S(13).GT.0), THEN ERROR;
          OTHERWISE, S(13) ← 1.
```

Event 25: Phone Information, Secondary Source

```
IF((S(13).NE.1).OR.(S(14).NE.0)), THEN ERROR;
OTHERWISE, S(14) ← 1.
```

Event 26: Phone Information, Primary Source

```
IF((S(13).NE.1).OR.(S(14).NE.0)), THEN ERROR;
OTHERWISE, S(14) ← 2.
```

Event 27: Deceased, Telephone

```
IF(S(13).NE.1).OR.(S(14).NE.0)), THEN ERROR;
OTHERWISE, S(14) ← 3.
```

Event 28: Data Entry, M1

```
IF((S(7).NE.2).OR.(S(15).NE.0).OR.S(12).EQ.3)), THEN ERROR;
OTHERWISE, IF(S(12).EQ.1), THEN PRINT;
          OTHERWISE, S(15) ← 1.
```

Event 29: Data Entry, M2

```
IF(S(9).NE.1).OR.(S(10).NE.2).OR.(S(15).NE.0).OR.(S(12).EQ.3)), THEN ERROR;
OTHERWISE, IF(S(12).EQ.1), THEN PRINT;
          OTHERWISE, S(15) ← 2.
```

Event 30: Data Entry, Telephone

```
IF((S(14).EQ.0).OR.(S(14).EQ.3).OR.(S(15).NE.0)), THEN ERROR;
OTHERWISE, IF(S(12).EQ.1), THEN PRINT;
          OTHERWISE, S(15) ← 4.
```

(continued)

Table E.6

(continued)

Event 31: Unidentifiable PSE Institution

```
IF((S(15).EQ.0).OR.(S(16).NE.0)), THEN ERROR;
OTHERWISE, S(16) ← 1.
```

Event 32: Transcript Access Refusal

```
IF((S(15).EQ.0).OR.(S(16).NE.0)), THEN ERROR;
OTHERWISE, S(16) ← 2.
```

Event 33: No Transcript Access Refusal

```
IF((S(15).EQ.0).OR.(S(16).NE.0)), THEN ERROR;
OTHERWISE, S(16) ← 3.
```

Event 34: Transcript Request Mailed

```
IF((S(16).NE.3).OR.(S(17).NE.0)), THEN ERROR;
OTHERWISE, S(17) ← 1.
```

Event 35: Transcript Received

```
IF((S(17).NE.1).OR.(S(18).NE.0)), THEN ERROR;
OTHERWISE, S(18) ← 1.
```

Event 36: Data Entry, Transcript

```
IF((S(18).NE.1).OR.(S(19).NE.0), THEN ERROR;
OTHERWISE, S(19) ← 1.
```

Event 37: Special Tracing Update

```
IF(S(5).LE.1), THEN ERROR;
OTHERWISE, UPDATE (NO CHANGE TO S(5)).
```

Event 38: Terminal Fail Edit (Refusal)

```
IF((S(7).NE.2).AND.(S(10).NE.2).AND.(S(14).NE.0)), THEN ERROR;
OTHERWISE, IF(S(12).NE.0); THEN ERROR;
          OTHERWISE S(12) ← 3.
```

Event 39: Questionnaire Remailing

```
IF((S(7).NE.1).OR.(S(11).NE.2)), THEN ERROR;
OTHERWISE, IF(S(9).NE.0), THEN PRINT;
          OTHERWISE, S(9) ← 2.
```

(continued)

Table E.6

(continued)

Event 40: Data Collected During Tracing

```
IF((S(7).NE.1).OR.(S(10).GE.2)), THEN ERROR;
OTHERWISE, IF(S(11).EQ.2), THEN ERROR;
          OTHERWISE, S(11) ← 3.
```

Event 41: Data Entry, Remailing

```
IF((S(9).NE.2).OR.(S(10).NE.2).OR.(S(12).EQ.3).OR.(S(15).NE.0)), THEN ERROR;
OTHERWISE, IF(S(12).EQ.1), THEN PRINT;
          OTHERWISE, S(15) ← 3.
```

Event 42: Data Entry, Combined Form

```
IF((S(7).NE.2).AND.(S(10).NE.2).AND.((S(14).EQ.0).OR.(S(14).EQ.3))), THEN ERROR;
OTHERWISE, IF((S(12).EQ.3).OR.(S(15).NE.0)), THEN ERROR;
          OTHERWISE, IF(S(12).EQ.1), THEN PRINT;
                    OTHERWISE, S(15) ← 5.
```

Event 43: Data Entry, Tracing Only

```
IF((S(7).GE.2).OR.(S(10).GE.2).OR.(S(14).EQ.1).OR.(S(14).EQ.2)), THEN ERROR;
OTHERWISE, IF(S(15).NE.0), THEN ERROR;
          OTHERWISE, S(15) ← 6.
```

NOTE: One general check, which was applicable to processing all event records (and which is not designated in individual checks specified), was a check of S(2). In processing any event if S(2) = 0, then the ERROR condition was raised.

Table E.7

SPECIFICATIONS FOR KEY ITEM EDIT

1) If response to item 1 is indeterminate, then fail edit.

2) If response to item 1 is "1" and any response is given to items 2 through 10 (excluding the box following Q.10), then fail edit.

3) If response to item 1 is "2" or greater, then

    a) If no response is given to items 2 through 10, then fail edit.

    b) If response to item 2 is indeterminate, then fail edit.

    c) If response to item 2 is "1" and any response is given to items 3 through 10 (excluding the box following Q.10), then fail edit.

    d) If response to item 2 is "2", then

        (i) If no response is given to items 3 through 10, then fail edit.

        (ii) If response to item 4 is indeterminate,[a] then fail edit.

        (iii) If response to item 6.a, 6.b, 6.c, or 6.d is indeterminate, then fail edit.

        (iv) If response to item 9 is indeterminate, then fail edit.

        (v) If transcript request is denied (i.e., box is checked and name signed in the transcript release statement--following Q.10), then fail edit.

4) If response is indeterminate[b] to any row of item 11, then fail edit.

5) Form 607-2 only: If response to item 15 is indeterminate,[c] then fail edit.

NOTE: The term "indeterminate," unless otherwise noted, means no response, illegible response, or multiple response (if applicable).

[a] This item is indeterminate if the PSE institution cannot be uniquely identified (e.g., listing multiple campus school without city).

[b] Note that multiple responses are allowable, as long as one of the responses is not column 1.

[c] Indeterminacy includes the following inconsistent pattern of responses: alternative 1 checked and any other alternative also checked.

Table E.8

STANDARD ERROR CODES USED IN MANUAL CODING AND KEYING

Error Condition	Alphabetic Code	Numeric Code
"Don't Know" response	DK	-5
Refusals	RE	-7
Out-of-range response	OR	-4
Inappropriate multiple response	MR	-2

All questionnaire coding for the second follow-up study, including that performed during manual edit, was done directly on the hard copy (i.e., source document), which had been designed for direct data transcription. Some coding was required for item 4 of the questionnaire, an open-ended item requesting name of school last attended. For each listed PSE institution, a five-digit FICE code with a check digit was entered directly onto the questionnaire (a unique code was used for any sample member school listed in item 4 that was unidentifiable by FICE code). Since a mailing label, which included a unique sample member ID number, had been attached to the questionnaires and to the telephone interview forms, it was not necessary to code the individual's ID number.

Following manual coding and editing, second follow-up questionnaire data, including ID number and batch number,[8] were transformed to machine-readable form by using direct data entry (key-to-tape) programmable terminals. Major advantages of this procedure were higher speed, fewer processing steps, and lower transcript error rate. A programmed format, specifically tailored for the survey questionnaire, appeared on a display screen as the terminal operator keyed the hard copy document. This allowed the operator to make easy corrections of keystroke errors and also to detect, at data entry, any errors that might possibly be corrected by review of the hard copy questionnaire. Error rates are typically lower than with keypunch equipment because operators can correct keystroke errors normally left for the verifier when keypunches are used. Also, 10 percent quality control checks were routinely performed on each batch of data keyed by each operator to maintain a keystroke error rates of less than .5 percent.[9]

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[8] Keying of batch number facilitated retrieval of hard copy documents (maintained in batch number order) when subsequent error resolution was required.

[9] Since this routine RTI quality control process is implemented by sampling the output of each involved key operator for each keyed batch, particularly error-prone batches were identified and completely rekeyed.

Table E.9

SECOND STAGE MANUAL EDIT AND CODING RULES

Item Number	Edit Check or Coding Problem	Error Resolution/Coding
1	Multiple Response	Enter MR in right-hand margin beside item.
2	Multiple Response	Enter MR in right-hand margin beside item.
3	Multiple Response	If multiple response exists, mark through all but numerically greatest (lowermost) response (e.g., if 1 and 6 are circled, mark through 1).
4	a) General	Considerable care in edit and code required. List of PSE institutions and associated codes--with check digits--provided. Code appropriate FICE or other unique code with check digit in right-hand margin beside question. If there is any uncertainty, coding supervisor should be consulted.
	b) Unresolvable or Inappropriate Response	Code OR in right-hand margin beside question.
5	a) General	Round total amounts to nearest dollar value.
	b) Out-of-Range	Any dollar amount greater than $15,000 should be considered out-of-range. That amount should be marked through and OR entered in right-hand margin beside the out-of-range response.
6	a) General	Edit this question separately for each line.
	b) Multiple Response	If multiple response exists on a given line, mark through all but numerically smallest (leftmost) response (e.g., if 1 and 5 are both circled on a line, mark through 5).
7	None	No edit required.
8	Multiple Response	Enter MR in right-hand margin beside item.

(continued)

Table E.9

(continued)

Item Number	Edit Check or Coding Problem	Error Resolution/Coding
9	a) General	If sub items 2, 3, or 7 are circled, resolution is needed from the coding supervisor. The intent of the question is to obtain information about educational or vocational licensing or certification. Response indicating drivers license, hunting license, or military promotions should not be honored. Where possible, responses to item 7 should be forced into one of the other categories, with an appropriate indication and the response to 7 marked out.
	b) Multiple Response	If "1" is circled and any other number is also circled, mark through the circle around 1.
10	a) General	Edit this question separately for each line.
	b) Multiple Response	If multiple responses exist on any line, then mark through all but the numerically smallest (leftmost) response (e.g., if 1 and 4 are both circled, mark through the 4).
Transcript Request	Code Only	No standard codes are to be used. Code in right-hand margin as follows: 1, if box is checked and name is signed; 0, otherwise.
11	a) General	Edit this question separately for each line.
	b) Multiple Response	If both column 1 and some other column are circled on a given line, then mark through the circle around 1.
	c) Inconsistent Response	1) If "6" is circled on any line and "2", "3", "4", or "5" is circled in some subsequent line (i.e., further down the page), contact coding supervisor. 2) If "2" is circled on any line and "3", "4", "5", or "6" is circled on any previous line (i.e., further up the page), contact coding supervisor.

(continued)

Table E.9
(continued)

Item Number	Edit Check or Coding Problem	Error Resolution/Coding
12	Multiple Response	If multiple response exists in either column, mark through all but the numerically greatest (lowermost) response in the column (e.g., if both 1 and 3 are circled in column 1, mark through the 1 in that column).
13	Multiple Response	Code MR in right-hand margin beside item.
14	Multiple Response	If multiple response exists, mark through all responses except the response nearest to "3". In the event that two responses are equidistant from "3", then mark through the numerically greatest (lowermost) response (e.g., if both 2 and 4 are circled, mark through 2).
15 (Form 607-2)	None	No edit required.
15 (Form 607-1) and 16 (Form 607-2)	a) General	Edit this question separately for each line.
	b) Multiple Response	If multiple response exists on any line, mark through all but the numerically largest (rightmost) response (e.g., if both 1 and 3 are circled, mark through 1).

NOTE: DK and RE codes were applicable to all questions and are not included in these specifications; however, questions requiring edit by line require special consideration for DK and RE coding. If the DK or RE apply to the entire question, then each line is coded appropriately; otherwise, only the applicable line is so coded.

The keying resulted in the creation of a raw data file with transformation of all alphabetic codes to numeric codes. Transformation of error codes is also shown above in Table E.8. The terminals were programmed to accept a specific range of values of most of the data and specific field widths for all data. Specifications for these checks are given in Table E.10.

B. Transcript Processing

The sequence of activities involved in processing student transcripts received from PSE institutions was similar to that described above for questionnaire returns; however, considerably more manual coding and editing were required. Briefly, the transcript coding operation involved abstracting and coding specific items of information from the large and diverse set of PSE transcripts for subsequent keying by the data entry staff. A standard Transcript Coding Form (TCF) and Coding Manual (see Appendix F) was developed for this purpose on the basis of early transcript returns.[10] The manual, which was dynamically revised during the manual coding operation, provided instructions for abstracting important items of information from the diverse transcript formats that were received. This information was manually coded onto a TCF prior to keying.

In addition to overall PSE performance data and academic attendance history, courses appearing on the individual's transcript had to be coded into several content areas, and various performance indices computed within each area. Thus, in contrast to the questionnaire coding, the transcript coding was not a straightforward clerical operation, but one that demanded careful attention and judgment of the coder. Coders for this operation were carefully selected and daily debriefing sessions were held by project staff during the first week of the coding operation to ensure a common base for coding decisions. Also, a quality control check of a sample of each coder's work was conducted weekly by a project staff member.[11]

Prior to initiation of data collection in the second follow-up, it was anticipated that several educational performance measures could be obtained or computed from the information recorded on each student's transcript, including: total number of credits attempted, total number of credits earned, proportion of attempted credits earned, and grade point average. Further, it was expected that each of these indices could be obtained/computed on the basis of the students' overall PSE record, as well as within major field of study and several other curriculum content areas of particular interest to USOE. Because of the uncertainties involved, however, RTI suggested that final specification of such variables and of the procedures for abstracting and coding these data be based on examination of a sample of preliminary transcript returns.

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[10] See also Riccobono, J. A., Wisenbaker, J. M., and Burkheimer, G. J. Description of Procedures Employed in Developing and Implementing a Transcript Processing Manual for the Second Follow-Up Evaluation of the Upward Bound Program. (Report RTI/1605/06 - 03 S). Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, October 1979.

[11] These safeguards resulted in reasonably satisfactory estimates of inter-coder reliability for most key transcript variables.

Table E.10

RANGE CHECKS FOR KEYING QUESTIONNAIRES

Item		Valid Codes
Form A	Form B	
ID #[a]	ID #[a]	0001 - 6050
Form Type	Form Type	A, B
Form Seq.	Form Seq.	1, 2, T, R, S
1	1	01 - 04, blank
2	2	01 - 02, blank
3	3	01 - 06, blank
4[a]	4[a]	01001 - 29999, 80000 - 99999, blank
5.i (i-1,15)	5.i (i-1,15)	i[b] or blank
5.16 - 5.18	5.16 - 5.18	00000 - 15000, blank
6.A - 6.E	6.A - 6.E	01 - 05, blank
7.A - 7.D	7.A - 7.D	000 - 999, blank
8	8	01 - 04, blank
9.i (i=1,7)	9.i (i=1,7)	i[b] or blank
10.A - 10.M	10.A - 10.M	01 - 05, blank
TRANS[c]	TRANS[c]	00 - 01
11.A.i -11.V.i (i=1,6)	11.A.i-11.V.i (i=1,6)	i[b] or blank
12.1 - 12.2	12.1 - 12.2	01 - 08, blank
13	13	01 - 03, blank
14	14	01 - 05, blank
NA	15.i - 15.i	i[b] or blank
15.A - 15.H	16.A - 16.H	01 - 04, blank

NOTE: Lead digits are specified; however, these were generated by the program, rather than entered by the key operator.

[a] Excluding Check Digit.

[b] Assumed 2 digits, right justified.

[c] In margin at bottom of page containing Q.10.

Actual examination of transcript returns revealed discrepancies among institutions in transcript content and format that were much more substantial than had been anticipated. In addition to the general problem of major disparity of transcript content and format among the large and diverse set of postsecondary institutions involved in the study, several interrelated problems were identified that precluded or vitiated construction of some of the previously planned indices for particular subgroups of students. These problems stemmed primarily from: (1) the frequency of school transfer behavior exhibited by student sample members together with a lack of complete information concerning the transferred courses listed on the transcript of the school last attended, and (2) the absence, on a large number of transcripts, of specific information that had been expected (e.g., college major). On the other hand, the preliminary examination of transcript returns also suggested several additional variables that could be obtained from information recorded on student transcripts.

After considerable discussion between RTI and USOE staff, decisions were reached regarding the deletion of redefinition of the previously anticipated variables as well as the inclusion of additional variables that seemed to be obtainable from the transcripts that had been collected. Those decisions have been documented separately.[12] Transcript data were keyed in the same manner described above for questionnaires.

VI. MACHINE PROCESSING

All subsequent processing of questionnaire and/or transcript data was computerized and was accomplished on a flow basis. Such processing was undertaken for two purposes: (1) to produce an accurate magnetic transcription of edited second follow-up questionnaires, and (2) to create meaningful analysis variables from these data and data from other external sources.

From the sources described in Section II, the second follow-up data base was constructed to be compatible with generalized statistical analysis routines.[13] The final data base consisted of records for each of the original 6,050 sample members containing (1) an encrypted student identification number, (2) selected portions of the extant base-year and first follow-up student data files, (3) a complete history of the individual's response status for the base-year, first follow-up, and second follow-up surveys, (4) a magnetic transcription of student responses to the second follow-up instrument, (5) selected information from an extant postsecondary institution characteristics file, as augmented, (6) analysis variables constructed from data contained in the data sets specified above, (7) analysis variables constructed from information coded from student transcripts, and (8) analysis weights appropriate for the various comparative/descriptive and relational analyses that were performed. The entire data base construction process was coordinated through the survey control system (described above in Section IV). The logical flow of constructing the data base for the second follow-up study is depicted in Figure E.4.

First, information from the previous master file was selected to produce a reduced master file. Following receipt, manual edit and coding, keying, and

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[12] Riccobono, J. A., et al., October 1979 (op. cit.).

[13] Burkheimer, G. J., et al., October 1979. (op. cit.)

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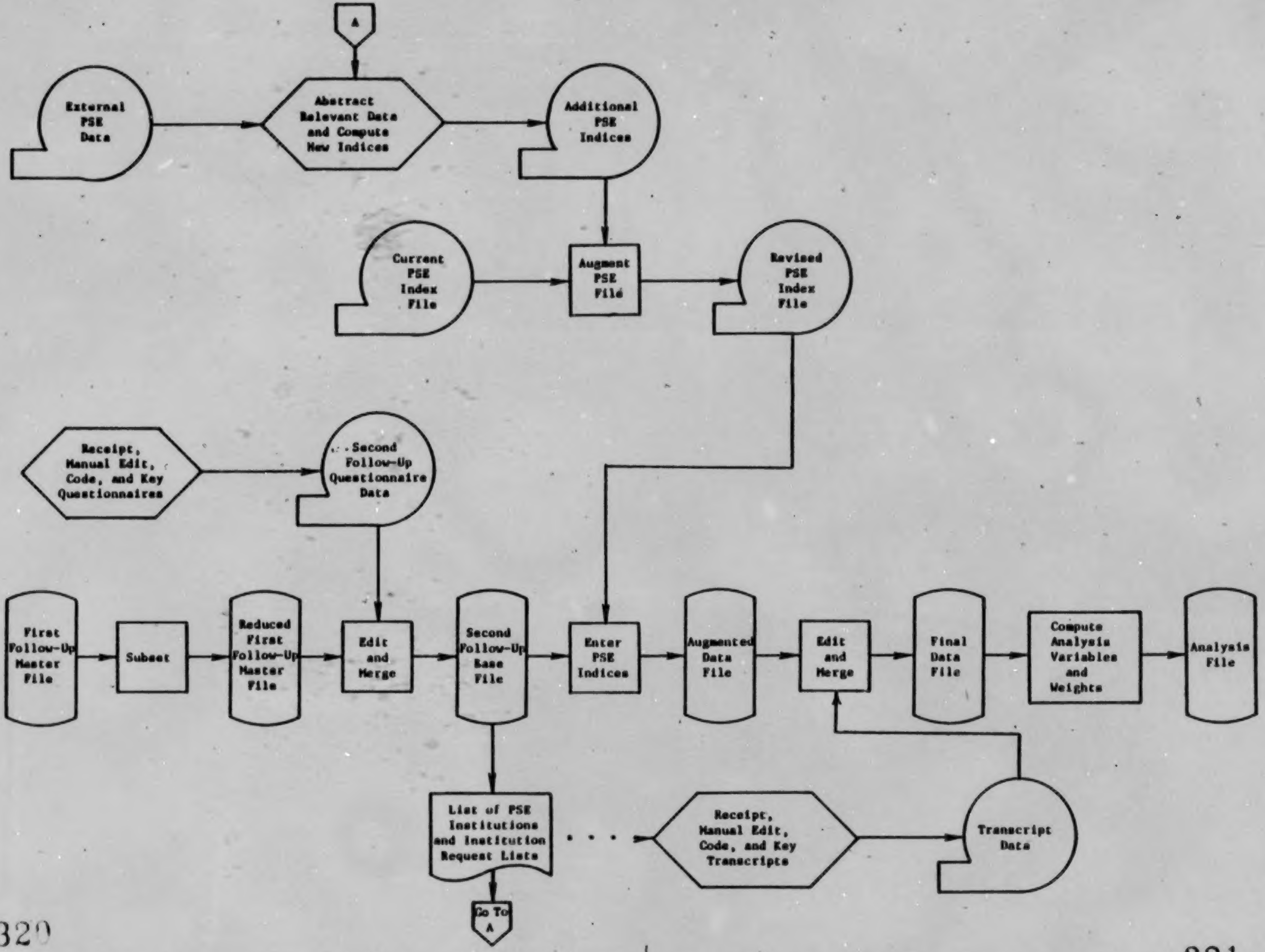
A
External PSE Data
Abstract Relevant Data and Compute New Indices
Additional PSE Indices
Current PSE Index File
Augment PSE File
Revised PSE Index File
Receipt, Manual Edit, Code, and Key Questionnaires
Second Follow-Up Questionnaire Data
First Follow-Up Master File
Subset
Reduced First Follow-Up Master File
Edit and Merge
Second Follow-Up Base File
Enter PSE Indices
Augmented Data File
Edit and Merge
Final Data File
Compute Analysis Variables and Weights
Analysis File
List of PSE Institutions and Institution Request Lists
Receipt, Manual Edit, Code, and Key Transcripts
Transcript Data
Go To A

Figure E.4. Logical flow for constructing the Second Upward Bound Follow-up evaluation data base.

transmission of the SFUQ, the data were edited and merged into the data base in a single computer operation. Once this file was completed, lists of PSE institutions attended by sample members and institutional request student listings could be generated. Lists of attended PSE institutions allowed an examination of the Institutional File to determine those institutions for which data augmentation was necessary (due to missing or incomplete institutional indices). Information was then abstracted from available external files to compute the required augmentation indices. These augmentation indices were then merged with the Institutional File to produce a revised institutional index file specific to the attended institutions. Indices for the appropriate institutions were then entered into the student records to produce the augmented student data file.

During the PSE index augmentation process, the institutional transcript request operation was initiated. A single computer operation edited these data, computed appropriate analytic variables, and merged those with the augmented data file to produce the final raw data file. Other analysis variables and weights were then developed from and added to this file.[14] While not shown in Figure E.4, the final step in producing the second follow-up data base was merging the survey control status records and the analysis file. Completion of this operation and subsequent masking or encrypting of identifying information resulted in the data base provided to USOE. A complete specification of the nature of the file developed with a complete file layout has been provided separately[15] and is not considered here. Two major steps in the file construction process (machine editing and analysis variable construction) are detailed in the following subsections.[16]

A. Machine Editing

Once a keyed data tape had been created (either student questionnaire or transcript) the data were merged with the extant Student Master File, following machine edit. The machine edit was undertaken using generalized editing software developed at RTI. Edit programs were tailored for this study following a generalized table-driven procedure supported by existing software, which makes extensive use of machine-readable codebooks.[17]

The additional step of machine edit was undertaken to ensure an accurate magnetic transcription of edited data and to assist in the creation of meaningful and error free analysis variables. Editing consisted of: (1) checking ID number and unique code for institution last attended for accuracy by means of an associated check digit, (2) preliminary data conversions and checks to ensure that all data elements were within prescribed valid code ranges, (3) checks to ensure that data elements within a given source (i.e., SFUQ or transcripts) were internally consistent, and (4) checks to ensure consistency of data from one source with data from other sources (e.g., consistency of SFUQ responses with transcript data and with previously collected data) and special recoding and imputations.

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[14] Additional encoding operations were performed during the actual conduct of analyses (e.g., data trimming and combination procedures); however, these operations are described in conjuction with descriptions of the analyses (Appendixes H and I).

[15] Burkheimer, G. J., *et al.*, October 1979. (*op. cit.*)

[16] Weight construction is described in Appendix G.

[17] These codebooks are tables of information on all data items in the data base (currently collected and previously collected data).

Resolution of errors detected during machine edit of second follow-up data elements took two forms. For key data elements (e.g., PSE institution last or currently attended, extent of UB participation, pattern of PSE attendance) or for cases in which error pattern or frequency suggested coding or keying error, hard copy documents were consulted in an attempt to resolve the error(s). For less important items, and for cases in which resolution from hard copy could not be realized, the involved data elements were appropriately flagged for identification during subsequent analysis.

An error-flagging procedure used by RTI in previous studies (base-year and first follow-up) as well as for the second follow-up study was applied to the data elements. This error-flagging process was accomplished during the editing process. Second follow-up data items (from SFUQ or transcripts) were typically coded in four or more digits. In most cases, the left-most byte or digit contains a consistency digit, and the next leftmost contains a quality digit.[18] The final digits consist of the datum itself and contain either a standard error code or a coded value. The diagram provided below illustrates the layout of a given field.

Consistency Digit	Quality Digit	Datum
1 Digit	1 Digit	2 or more digits

The consistency digit reflects the consistency of the data element with data collected from other sources (i.e., among source consistency). The codes used are:

0 = consistent among sources;
1 = inconsistent among sources.

The quality digit reflects the consistency of the datum within a given instrument (source) as well as an indication of whether the datum was imputed. Codes used are:

0 = Original data;
2 = Data logically imputed;
4 = Data stochastically imputed;
6 = Original data not consistent with internal skip patterns;
8 = Original data internally inconsistent with other data items.

---

[18] The consistency digit is applicable only to data elements for which consistency checks were available. To conserve space, the consistency digit was only appended to such data elements.

The standard error codes reflect various forms of missing or otherwise indeterminate data. The codes used are:

-1 = Missing data (item nonresponse);
-2 = Inappropriate multiple response;
-3 = Legitimate nonresponse;
-4 = Out-of-range or illegible response;
-5 = Don't know responses;
-6 = Nonresponses inconsistent with routing item;
-7 = Stated refusal;
-8 = Items not administered;
-9 = Instrument nonresponse.

This fairly elaborate coding system allows both an accurate representation of the hard copy and a method whereby data quality could be considered at many different levels when constructing analysis variables.[19]

1. Specific Machine Edit Rules for SFUQ Items[20]

a. ID Verification

ID verification involved check digit verification, range (0001 - 6050) verification, and verification against survey status vectors for data applicability (see Section IV above). Data with faulty IDs or with a suggestion of inappropriate information were not entered into the data file, and generated a list for hard copy resolution.

b. Preliminary Data Conversion and Out-of-Range Checks

Out-of-range checks were analogous to those specified in Subsection V.A (Table E.10). Each item was checked for legitimate error codes and for legitimate non-error values. In addition, the preliminary data conversions specified in Table E.11 were performed. These conversions involved some imputations. If any item was out-of-range, the record was not entered, and an appropriate error message was printed to facilitate hard copy lookup.

c. Check Digit Verification--FICE Code

FICE or other unique institutional codes were verified against the check digit generation algorithm, in addition to the range check specified. Questionnaires failing this check were not entered and generated an appropriate error message to facilitate hard copy look-up.

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[19] The analysis variables themselves do not contain quality or consistency digits, but allow representation by a standard error code (only -1, and -3 are appropriate to analysis variables).

[20] It should be noted that the editing rules specified in this appendix were not applied indiscriminately to the raw keyed output file. Rather, extensive preedit examination of the keyed data was implemented, in which resolution of problem records was attempted through examination of hard copy and/or specific post hoc. rules. Since these preedit data adjustments were in most cases idiosyncratic, they are not treated in this appendix.

Table E.11

PRELIMINARY DATA CONVERSIONS

Item 1

If Item 1 is blank, then set value of Item 1 to -1.

Item 2

If Item 2 is blank, then set value of Item 2 to -1.

Item 3

If Item 3 is blank, then set value of Item 3 to -1.

Item 4

If Item 4 is blank, then set value of Item 4 to -1.

Item 5

Step 1

If all of Subitems 5.1-5.15 are blank, then set all values to -1; otherwise set any blank value to 0.

Step 2

If all of Subitems 5.16-5.18 are blank, then set all values to -1; otherwise set any blank value to 0.

Item 6

If any of Subitems 6.a through 6.e are blank, then change all blank values to -1.

Item 7

If all of Subitems 7.a-7.d are blank then set blank values to -1; otherwise set blank values to 0.

Item 8

If Item 8 is blank, then set value of Item 8 to -1.

Item 9

(a) If all of Subitems 9.1-9.7 are blank then set all values to -1; otherwise set any blank value to 0.

(b) If Subitem 9.1 has a value of 1 and any of 9.2-9.7 also has a value of 1, then set value of 9.1 to 0.

(continued)

Table E.11
(continued)

Item 10

If any of Subitems 10.a-10.m is blank, then set the value of that Subitem to -1.

Transcript Box

If Transcript Box entry is blank, then set value of Transcript Box to 0.

Item 11

Item 11 exists in matrix form in the keyed output file, with rows x, x ← a,b,...,v, corresponding to various time periods and with columns y, y ← 1,2,...,6 corresponding to type of enrollment during a time period (see Appendix B). The transformation for this item involves a reduction of item responses to a single response in each time period (row) x.[a]

Step 1

Convert all blanks to -1.

Step 2

For each x, compute $G_x = \sum_{y=1}^{6}(11.x.y > 0)$.

Step 3

```
IF ($G_x$.EQ.0)  $R_x$ ← 11.x.1;
IF ($G_x$.EQ.1)  $R_x$ ← FUNCT(11.x.y);
IF ($G_x$.GT.1)  ERROR;
where FUNCT(11.x.y) is given by:
     DO 5 I = 1,6
     IF(11.x.I.EQ.1) GO TO 10.
5 CONTINUE.
     ERROR
10 $R_x$ = I.
```

If the error condition is raised, the record is not processed further, and a printout is generated to facilitate resolution. Otherwise, the vector R contains the transformed values for item 11.

(continued)

Table E.11
(continued)

Item 12

(a) If Subitem 12.1 is blank, then set 12.1 to -1.

(b) If Subitem 12.2 is blank, then set 12.2 to -1.

Item 13

If Item 13 is blank, then set Item 13 to -1.

Item 14

If Item 14 is blank, then set Item 14 to -1.

Item 15 (Form B)

If all of Subitems 15.1-15.4 are blank then set all values to -1; otherwise set all blank values to 0.

Item 16 (Form B) or 15 (Form A)

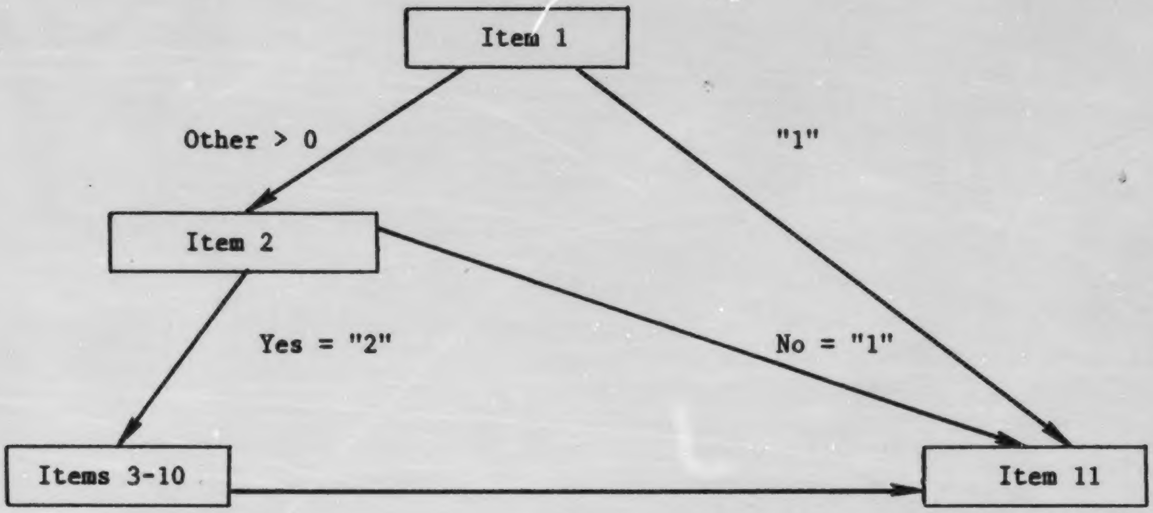
If any of Subitems a-h are blank, then set the value of that subitem to -1.

---

a/ Although this item allowed multiple responses for a given row, preliminary examinations of responses to this item indicated that little information would be lost in such a transformation.

d. Skip Pattern Checks and Procedures

There are two skip patterns (nested) in the SFUQ, that can be represented as follows:



In general, the skip pattern checks that were performed prescribed a special coding with a flag or unique nonresponse code for a routing question that had been ambiguously answered with respect to responses provided to questions within the skip pattern. Also, data for questions within a skip pattern were flagged or specially coded to indicate any inconsistency with the response to the routing question. The flag consisted of a leading six for otherwise legitimate responses, and a negative six code for nonresponse. Appropriately omitted items were also indicated as such by a unique nonresponse code.

Since the patterns were nested, checks were performed from outside-in; that is, a check was made of the outermost skip pattern first. If the check failed, then the inner pattern was not checked, since it was necessarily inconsistent with the outer routing question. There are two ways in which the check of the outermost skip pattern did not fail: (1) the item indicated a skip and all responses within the routing pattern were -1 or (2) the item did not indicate a skip and at least one response other than -1 existed within the routing pattern. In the first case, it was not necessary to perform the innermost check; in the second case, the innermost pattern was checked.

The transcript request blank, which followed Item 10, and which was within both skip patterns, required special treatment. Since this datum was coded only as 0 or 1 (i.e., no nonresponse code is allowed), it was not considered during the skip pattern check. Following a determination of skip pattern failure or non-failure, the item was recoded as indicated in Table E.12.

Table E.12

CODING OF TRANSCRIPT REQUEST

	Value of Datum	
Result of Check	0	1
Check Fails	600	601
Check OK (no answer required)	-3	-3
Check OK (answer required)	0	1

For any questionnaire failing a skip pattern check, a printout was generated, identified by ID number, indicating the before and after values of the data elements involved (including the transcript request box value). The general nature of the checks performed and the action taken are given in Figure E.5.

e. Internal Consistency Checks

Internal consistency checks were performed for various combinations of items. In general, the procedure used in performing these checks involved examining logical statements of the form:

[If condition 1 holds for item y, then condition 2 should hold for item z*].

If the logical statement was true, then no action was required; otherwise, each item involved in the check was flagged with a leading 8. This was accomplished by adding a constant to the datum, e.g.

datum ← datum + $8*10^{(w-2)}$, where w = full field width for the datum (including space reserved for flags).

These consistency checks were not performed until previous edit checks (out-of-range and skip pattern checks) had been performed. The check was not performed if: (1) either field was represented by a value less than 0, or (2) either field was represented by a value equal to or greater than $10^{(w-2)}$, where w is the field width (including space reserved for flags). For any questionnaire failing a consistency check, a printout was generated, identified by ID number, indicating the before and after values of the data elements involved.

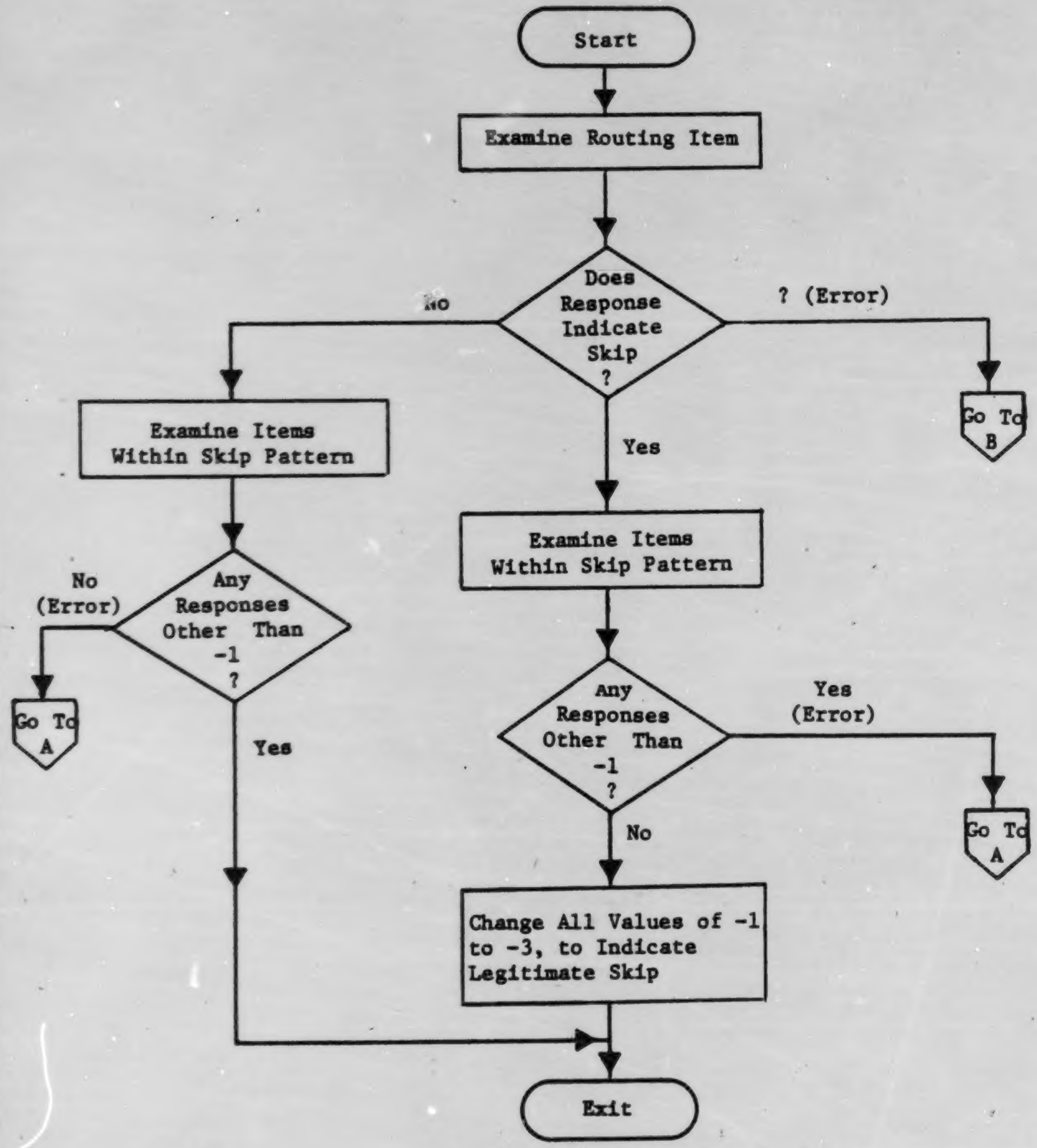

Start
Examine Routing Item
Does Response Indicate Skip ?
No
? (Error)
Go To B
Yes
Examine Items Within Skip Pattern
Examine Items Within Skip Pattern
No (Error)
Any Responses Other Than -1 ?
Go To A
Yes
Any Responses Other Than -1 ?
Yes (Error)
Go To A
No
Change All Values of -1 to -3, to Indicate Legitimate Skip
Exit

Figure E.5. Edit steps for skip patterns.

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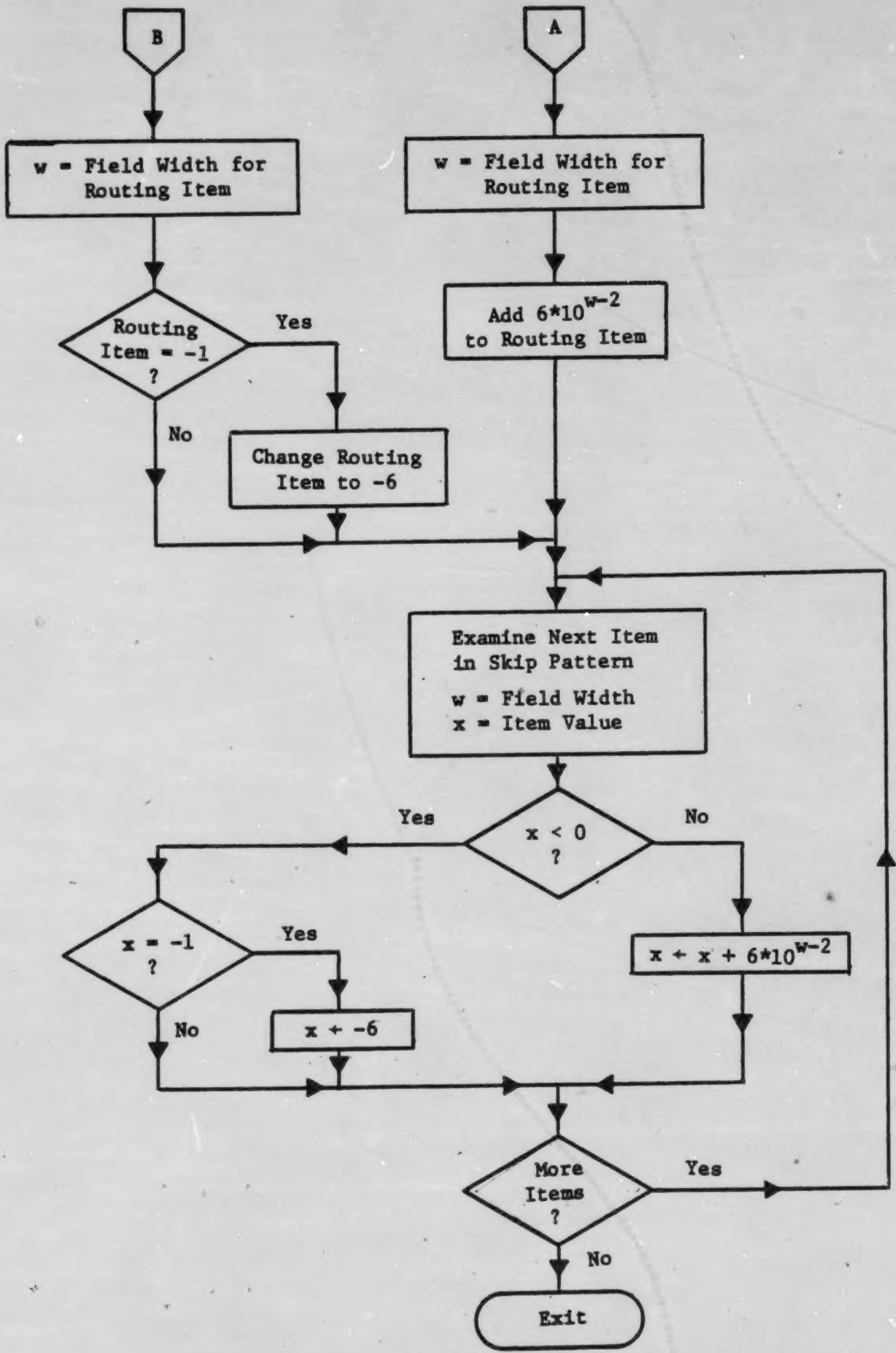

B
A
w = Field Width for Routing Item
w = Field Width for Routing Item
Add $6*10^{w-2}$ to Routing Item
Routing Item = -1 ?
Yes
No
Change Routing Item to -6
Examine Next Item in Skip Pattern
w = Field Width
x = Item Value
x < 0 ?
Yes
No
x = -1 ?
Yes
No
x ← -6
$x \leftarrow x + 6*10^{w-2}$
More Items ?
Yes
No
Exit

Figure E.5. (Continued)

The specific consistency checks performed were:

(1) Items 1, 2, and 11

If ((Item 1.EQ.1).OR.(Item 2.EQ.1)), then none of 11.x should be greater than 2.

(2) Items 2 and 11

If (Item 2.GE.2), then Subitem 11.v should not be 2.

(3) Item 11

(a) If at least one of 11.x equals 6, let z = the minimum row number in which 11.x = 6; then for any x greater than z, 11.x should not equal 2,3,4, or 5.

(b) If at least one of 11.x equals 3,4, or 5, let z = the minimum row number in which 11.x = 3,4, or 5; then for any x greater than z, 11.x should not equal 2.

(4) Item 12

Let x = response to subitem 12.1; then if (x.GT.0), then 12.2 should be equal to or less than x.

(5) Item 15 (Form B)

If (Subitem 15.1.EQ.1), then each of subitems 15.2-15.3 should be 0.

f. External Consistency Checks

The remaining consistency checks involved checks of SFUQ data with those collected in previous data collection efforts. In general, the procedure used in performing these checks involved examining logical statements of the same form as those indicated above for internal consistency checks (Subsection VI.A.1.e). If the logical statement was true, then no action was necessary; otherwise, each item involved in the check was flagged with a leading 1, this was accomplished by adding a constant to the datum, e.g.

datum $\leftarrow$ datum + $10^{(w-1)}$, where w = full field width for the datum (including space reserved for flags).

These consistency checks were not performed until all other checks (out-of-range, skip pattern, internal consistency) had been performed. The check was not performed if either of the two conditions specified for internal consistency checks (Subsection VI.A.1.e) obtained. For any data failing a consistency check, a printout was generated, identified by ID number, indicating the before and after values of the data involved.

The specific consistency checks performed were:[21]

(1) Items 1 and 2

If ((Item 1.EQ.1).OR.((Item 1.EQ.2).AND.(Item 2.EQ.1)), then (EDHS+.NE.2)

(2) Item 2

If (Item 2.EQ.1), then (PENS.NE.2)

g. Special Recoding and Imputations

(1) Item 5

Subitems can be grouped into three paired sets (X,Y):

X	Y
1-8	16
9-12	17
13-15	18

For each of these three pairings, the recodings specified in Table E.13 were performed, depending on the value of elements in (X,Y).

Table E.13

SPECIFIC RECODINGS FOR ITEM 5

	Value of Y			
Value of X	-1	0	>0	Other
All -1	a	c	a	a
All 0	b	a	e	a
At least one 1	a	d	a	a
Other	a	a	a	a

a) No action

b) Change value of item in Y to 0

c) Change value of all items in X to 0

d) Change value of item in Y to -1

e) Change value of all items in X to -1

---

[21] Checks also were not performed if FFU variables were greater than 2.

(2) Item 6 (Performed in order given)

(a) If there were any legitimate responses to 6A-6C (e.g., 1-5) and there was also a nonreponse code for 6A-6C (e.g., -1) then the following imputations were performed:

(i) If all legitimate responses were 01, change -1 values to 201;

(ii) If all legitimate responses were 02 or greater, change -1 value to 205;

(iii) Otherwise no imputation.

(b) If there were legitimate (original or imputed) responses to 6A-6C and a nonresponse code for 6D, then the following imputations were performed:

(i) If all responses were 01, change -1 to 401;

(ii) If all responses were 02 or greater, compute the average of the responses (do not count imputation flag, if present), round to nearest integer, and add 400; replace the -1 with this number;

(iii) Otherwise, no imputation.

(c) If there were legitimate (original or imputed) reponses to 6A-6C and a nonresponse code for 6E, then the following imputations were performed:

(i) If all responses were 01, change -1 to 402;

(ii) If all responses were 04 or greater, change -1 to 404;

(iii) If all responses were 02 or 03, change -1 to 401;

(iv) Otherwise, no imputation.

(3) Item 7

(a) If any legitimate response (i.e., a number equal to or greater than zero) existed for 7A-7D, then any nonresponse (-1) was changed to 0 and steps b and c were implemented. If all responses were -1, then no action was taken.

(b) Compute SUM = 7A + 7B + 7C + 7D.

(c) Perform the following recoding:

  (i) If SUM ≠ 100 then recompute as follows

$$7.i \leftarrow [(7.i \times 100)/SUM] + 2000, \; i \leftarrow A, B, C, D$$

  (ii) Otherwise, no action.

(4) Item 10

If there were legitimate responses to any of items 10A-10M and also nonresponse codes for at least one of 10A-10M, the following imputations were performed:

(a) If none of the legitimate responses were 1, then all -1 were changed to 401.

(b) If some legitimate responses were 1, but none were 2, then all -1 were changed to 402.

(c) Otherwise, no imputation.

(5) Item 11

This item existed in a transformed status with a single response for each time period x. If all entries were -1, then no imputation was necessary. Moreover, if the only non-zero entries were 1, then no reasonable imputation could be performed. If none of these conditions were met, then the following imputations were performed.

(a) If some entry was 2, then determine z = max (row number with a 2 entry), and

  (i) Change the value of any of rows a, e, i, m, q, or u that was less than z and represented by -1 to 401.

  (ii) Change any other row less than z and not one of the rows a, e, i, m, q, or u that was represented by -1 to 402.

  (iii) For any row y, where y = c, g, k, o, or s, greater than z that was represented by -1:

    A. If response to row y-1 was not missing (i.e., positive) and was identical to that for row y + 1, then change the response for row y to 400 greater than response to row y-1.

    B. Otherwise change y to 401.

(iv) For any other row greater than z that was represented by -1 change the value to 401.

(b) If no entry equaled 2, then determine z = min (row number with an entry of 3,4,5, or 6), and

(i) Perform no imputations for rows less than z.

(ii) For any row y, where y = c, g, k, o, or s, greater than z that was represented by -1:

A. If response to row y-1 was not missing (i.e., positive) and was identical to that for row y + 1, then change the response for row y to be 400 greater than the response to row y-1.

B. Otherwise change y to 401.

(iii) For any other row greater than x that was represented by -1, change the response to 401.

(6) Item 12

If response to 12.2 was a legitimate response (i.e., 1-8) and 12.1 was -1, then

12.1 ← 12.2 + 400

(7) Item 15 (Form A) and 16 (Form B)

If there was a legitimate response (i.e., 1-4) to any of subitems A-H and also a nonresponse code (i.e., -1) for one or more of subitems A-H, then all -1 were changed to 401.

2. Machine Edit Rules for Transcript Coding Form (TCF) Data

The data from the TCF was used for two major purposes: (a) to augment SFUQ data, and (b) to serve as a basis for construction of analysis variables. USOE had expressed a disinterest in a clean data file of TCF data, so that editing of the TCF file was strictly to support one of the two purposes specified above. Rules for editing and SFUQ augmentation are provided in this subsection. Rules for analysis variable construction are provided in Subsection VI.B.4.b.

a. ID Verification

Student ID verification involved check digit verification as well as a range check. Additionally, the appropriateness of the transcript data was verified through the survey control system. Data with invalid numbers were not entered into the data file, and generated a list for hard copy resolution. Further, the output file should be sorted by student ID # in preparation for merging into the student master file.

b. Preliminary Data Conversion and Out-of-Range Checks

Initial data conversion of blanks, alphabetic data, etc. to appropriate codes were performed prior to merging the TCF data with student questionnaire data; however, these conversions applied only to TCF items 7 and 9. These conversions are specified in Table E.14. Out-of-range checks were performed for the TCF data. This involved checking each item against the legitimate values (after conversion) specified in Table E.15. If any item was out-of-range, the data was not entered, and an appropriate error message was printed to facilitate hard copy lookup.

c. Specific Consistency Checks[22]

These checks were performed for internal consistency of TCF items. Forms failing these checks were not processed, and appropriate error messages were generated.

(1) Check 1

Let N be the number of unique item 10 pages represented for a given record.

IF(TCF8.NE.N), then error.

(2) Check 2

Let K represent the number of non-blank unique 3-tuples of data (standard code, # credits A, # credits B), for a particular entered content area.

IF(K.LE.0), then error.

(3) Check 3

Let each of the unique 3-tuples represent elements of a vector X.

IF(((X_2.EQ.0).OR.(X_2.EQ.blank)).AND.((X_3.EQ.0).OR.(X_3.EQ.blank) .AND.(X_1.NE.40)), then error.

(d) Rules for Augmenting SFUQ Data from TCF Data

Items 7 and 9 of the TCF were used to augment SFUQ data. Following a general edit of the TCF file, these augmentations were implemented

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[22] In processing data for these checks, some anomalies existed for the "page 03" representations of item 10 entries. Particularly, blank "page 03" records were encountered. Two possibilities existed: (1) page number as well as data values blank, (2) valid page number but all data values were blank. This occurred mainly in the event that TCF8 = 0,and the "page 03" record was voided. Under other circumstances, an error condition was raised and no additional processing attempted for that individual.

Table E.14

VALID ENTRY CODES/RANGES FOR TCF DATA

Item	Valid Codes
1[a]	0001-6050
2	1-6, blank
3	Y, blank
4	Y, blank
5	S, Q
6	Y, N, blank
7.i (i = 1,6)	i or blank
8	0-7
9.A-9.V	01-10, blank
10.CA.1[b]	1-7 or blank
10.SC.i.j	30, 22, 20, 18, 17, 15, 13, 12, 10, 8 7, 5, 3, 0, 40 or blank
10.A.i.j	0-150 or blank (F4.1)
10.B.i.j	0-150 or blank (F4.1)

[a] Excluding check digit (A-K)

[b] Where i = 1, 2, ..., n
j = 1, 2, ..., 15
n = value of item 8

Table E.15

PRELIMINARY TCF DATA CONVERSIONS

<u>Item 7</u>

(a) If all of Subitems 7.1-7.6 are blank, then set value of 7.1 to 1 <u>and</u> set value of all Subitems 7.2-7.6 to 0.

(b) If Subitem 7.1 has a value of 1 <u>and</u> any of 7.2-7.6 has a value of > 1, then set value of 7.1 to 0.

(c) If Subitem 7.1 has a value of 0 <u>and</u> any of Subitems 7.2-7.6 has a value of > 1, then set the value of the latter Subitem(s) to 1.

<u>Item 9</u>

If any of Subitems 9.a-9.v is blank, then set the value of that Subitem to -1.

---

as specified below:

(1) <u>Item 7 of TCF (item 9 of SFUQ)</u>

```
IF(TCF7.1.EQ.1).OR.(TCF7 otherwise indeterminate), then
take no action;

Otherwise,

     IF(SFUQ9 indeterminate), then

          SFUQ9.1 ← 200
          SFUQ9.7 ← 200, and
          SFUQ9.i ← 200 + TCF7.i, for i ← 2, 3, ..., 6;

     IF(SFUQ9 determinate), then

          IF(SFUQ9.1.NE.0), then SFUQ9.1 ← 200;

          IF((SFUQ9.i.EQ.0).AND.(TCF7.i.EQ.1),
            then SFUQ9.i ← 201, for i ← 2, 3, ..., 6
```

(2) <u>Item 9 of TCF (Item 11 of SFUQ)</u>

```
For i ← a, b, ..., v

IF(TCF9.i is indeterminate), take no action;

Otherwise,
(a) If (SFUQ11.i is indeterminate or already imputed), then
      (i) IF(TCF9.i < 6), then SFUQ11.i ← TCF9.i,
     (ii) IF(TCF9.i ≥ 6), then SFUQ11.i ← 400 + (TCF9.i - 5);
(b) IF(SFUQ11.i is determinate and not previously imputed), then
      (i) IF(TCF9.i < 6), then SFUQ11.i ← TCF9.i;
     (ii) IF(TCF9.i ≥ 6), then take no action.
```

B. Constructing Analysis Variables

In constructing analysis variables for the UB second follow-up study, some of the data elements established for the base-year and first follow-up studies were employed. Other variables, however, were constructed from new information, derived primarily from the SFUQ and the STF. Many of the analysis variables, both old and new, were simple recodings of the raw data elements, while others were more complex composites or combinations of raw data elements. Whatever the final make-up of a variable, the primary purpose of analysis variable construction was the operationalization of constructs of interest such as "pattern of UB participation," "educational progress/persistence," or "educational performance" in order to address the research questions statistically.

1. General

Table E.16 provides a list of the conceptual variables (or sets of variables) considered in the UB second follow-up analyses. Three major variable sets may be identified: (a) the criterion variable set (outcome measures), (b) the predictor variable set (process measures), and (c) the concomitant variable set (control measures). The criterion variable set reflects the educational outcomes referenced in the analysis questions (see Chapter 1 of the report). In the main, this set of variables was comprised of responses to the second follow-up questionnaire and information obtained from the student transcripts (or combinations of these variables with those collected in the base-year study or externally). This variable set may be specified as variables 1 through 17 of Table E.16.

The predictor variable set was comprised of one variable; namely, pattern of UB participation (variable 18 in Table E.16) which was derived from base-year and first follow-up information or from item 15 of Form B of the second follow-up questionnaire.[23]

The concomitant variable set was comprised primarily of information collected during the base-year study. The specific variables are age, sex, race,

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[23] As noted earlier, Form B of the second follow-up questionnaire was designed for those individuals for whom insufficient previous data had been collected to define pattern/extent of UB participation.

Table E.16

CONCEPTUAL ANALYSIS VARIABLES

1. *Characteristics of entered PSE institution* (specified by item 3 of SFUQ combined with extant PSE index data).
2. *Educational progress* (determined from items 1, 2, 9, and 11 of SFUQ, from SMF, and from STF).
3. *Educational persistence* (determined from items 1, 2, 3, 8, 9, 11, and 12 of SFUQ).
4. *High school completion* (determined from item 1 of SFUQ second from SMF).
5. *Postsecondary entry* (determined from item 2 of SFUQ, from SMF, and from STF).
6. *Postsecondary graduation* (determined from item 9 of SFUQ and from STF).
7. *Lag entry to PSE* (determined from item 11 of SFUQ and from SMF).
8. *Educational performance* (determined from STF).
9. *Postsecondary Transfer* (determined from items 3 and 11 of SFUQ and from the STF).
10. *Amount and type of financial aid package* (determined from items 5 and 7 of SFUQ).
11. *Educational expectations and aspirations* (determined from item 12 of SFUQ).
12. *Deterents to educational progress* (determined from item 15 of Form A of SFUQ or item 16 of Form B).
13. *Availability of services and programs* (determined from item 10 of SFUQ).
14. *Utilization of services and programs* (determined from item 10 of SFUQ).
15. *Adequacy of financial assistance* (determined from item 6 of SFUQ).
16. *Current work status* (determined from item 13 of SFUQ).
17. *Satisfaction with quality of life* (determined from item 14 of SFUQ).
18. *Pattern of UB participation* (determined from item 15 of Form B of SFUQ and from SMF data).
19. *Age within grade* (determined from SMF).

(continued)

Table E.16

(continued)

20. Race (determined from SMF).

21. Sex (determined from SMF).

22. Grade in Fall 1973 (determined from SMF).

23. Poverty status in Fall 1973 (determined from SMF).

24. Academic risk status Fall 1973 (determined from SMF).

25. UB project characteristics (determined from base year data).

grade level in fall 1973, poverty status, academic risk status, and UB project characteristics[24] (variables 19 through 25 in Table E.16).

Although the taxonomy of variables presented above is a convenient one, it should be recognized that in addressing specific analysis questions the distinction between criterion variables and concomitant variables was not as straightforward as indicated. Specifically, some variables listed in the criterion variable set were used as control variables when considering other criterion variables. For example, educational performance, progress, and persistence are complex outcomes that are interrelated, as well as theoretically related to certain characteristics of the institution attended (e.g., size, level of offering, institutional selectivity), utilization of services and programs, educational aspirations, perceived deterrents, and adequacy of financial aid. While such considerations are not explicit in the analysis questions, they are implicit in any careful analysis of these data.

2. PSE Institutional Indices

Fourteen PSE institutional indices were obtained directly from the Institutional File or from USOE directories of funded UB and SSDS programs.[25] For schools not represented in the Institutional File, these indices were imputed (to the extent possible). Institution identification was determined from responses to item 4 of the SFUQ. The specific PSE institutional indices were developed by USOE and are generally defined in the first ten entries in Table E.17; the next four entries were determined from program directories. Two additional indices (used primarily as cross-classifiers in some of the tabular presentations) related to the type of PSE institution attended were computed, and are shown as the last two entries of Table E.17. The computation

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[24] Each UB participant was associated with a specific project and comparison students were also associated with a UB project by virtue of their being in a high school served by the project.

[25] Only eight of these indices were actually used in analysis, due to either base rate problems, data indeterminacy problems, or redundancy.

Table E.17

INSTITUTIONAL INDICES OBTAINED OR COMPUTED

Mnemonic	Variable Description
IOFCON	Partial crossing of institutional control (public, private) with level of offering (vocational/technical, two-year college, four-year college)
ISES	Institutional SES (family income characteristics of student body)
ISEL	Relative institutional selectivity (derived from average scores on standardized tests)
ICOST	Composite per-student cost of attending institution
ISIZ	Undergraduate student enrollment
IRACE	Predominant (historical, traditional) race of student body
ISTYP	Specialty training (health related, theological) indicator
DEC10	Decile of freshmen becoming sophomores at institutions
DEC11	Decile of freshmen who graduate at institution
FGPA	Overall GPA for freshmen at institution
UBHOST	UB host status (during 1978) of institution
UBHOSTC	UB host status (during any year from 1974-1978) of institution
SSHOST	SSDS host status (during 1978) of institution
SSHOSTC	SSDS host status (during any year from 1974-1978) of institution
IOFF	Level of offering of institution last attended
ITYP	Highest level of offering of any institution attended

of these latter variables was relatively straightforward and has been separately documented.[26]

3. Project Characteristics

Because of the potential for policy-relevant findings, analyses for both the base-year and first follow-up studies had included investigations of the possible impact of project affiliation or specific characteristics of the associated project; however, none of these previous analyses had been fruitful. In effect, the second follow-up analyses provided an omnibus test for project differences, indicating no unique project effects once student background factors were statistically controlled.

In developing project characteristic variables, it was clear that the variable of simple project association should not be used since previous examination of this variable had proved to be so fruitless. The two project characteristics deveoped were: (1) project emphasis (basic skills approach vs. other approaches) and (2) a measure of aggregate racial characteristics of project participants. These variables were obtained directly from base year sampling files.[27]

4. Student Variables

The conceptual student variables are those listed from 2 to 25 in Table E.16. All the conceptual analysis variables map specific questionnaire items, prior data, or transcript data onto one or more of the analysis questions. As noted above, variables 2 through 17 are directly related to the analysis questions and are considered primarily outcome variables, while variables 18 through 24 may be considered either control or predictor variables.

Some of the student variables or constructs indicated in the analysis questions were relatively straightforward (e.g., current work status, problems experienced), and the items measuring them were also relatively straightforward. Other constructs (e.g., educational performance, progress, and persistence) were much more complex and interrelated, and the attempts to define and measure such constructs reflect this complexity.

a. SMF Student Variables

The variables to be obtained directly from the SMF correspond to variable sets 20-24 in Table E.16. Specific variables used are specified in Table E.17. An additional variable obtained from a combination of SMF entries is a measure of age within grade (AGE GRD). This variable was computed from the SMF variables AGE, reported age in spring 1974, and BGRADE, as defined in Table E.18. The exact nature of this variable is indicated in Table E.19. Other variables were developed using SMF information in combination with SFUQ data, but these variables are discussed below in Subsection VI.B.4.c.

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[26] Burkheimer, G. J., Fuentes, E. J., Riccobono, J. A., and Wisenbaker, J. M., Data Analysis Plan for the Second Follow-up Study of the Upward Bound Program (Report RTI/1605/05-01S). Research Triangle Park, N.C. Center for Educational Research and Evaluation, Research Triangle Institute, March 1979.

[27] The variables were not used in any of the analyses documented in this report.

Table E.18

STUDENT VARIABLES OBTAINED FROM THE EXTANT STUDENT MASTER FILE

Mnemonic	Variable Description
RACEC	Race (Black, white, other)
SEXC	Sex (Male, female)
BGRADE	Grade level in fall 1973 (10, 11, 12)
POVSC	Poverty status in 1973 (poverty level, not poverty level)
RISKC	Academic risk status in 1973 (risk, not risk)

Table E.19

PRODUCING AN INDEX OF OVER AGE WITHIN GRADE (AGE GRD)

	Value of BGRADE			
Value of AGEC	Indeterminate	10	11	12
Indeterminate	-1	-1	-1	-1
14	-1	1	1	1
15	-1	1	1	1
16	-1	1	1	1
17	-1	2	1	1
18	-1	2	2	1
19	-1	2	2	2
20	-1	2	2	2
21	-1	2	2	2

b. STF Student Variables

These variables are those included under conceptual variables 2, 6, and 8 in Table E.16. The variables abstracted from transcripts are shown in Table E.20.[28] Transcript-based variables were constructed only in the case that TCF forms were available and appropriate; otherwise, standard indeterminate data codes were assigned. Rules for construction of these variables are provided below.

(1) Determining the value of MAJOR

```
IF (TCF2 is blank), then MAJOR ← -1
     Otherwise, MAJOR ← TCF2
```

(2) Determining the value of ACPROB

```
IF (TCF3 is blank), then ACPROB ← 0
IF (TCF3 is "Y"), then ACPROB ← 1
```

(3) Determining the value of ACDIS

```
IF (TCF4 is blank), then ACDIS ← 0
IF (TCF4 is "Y"), then ACDIS ← 1
```

(4) Determining the value of TGRAD

```
IF (TCF6 is blank), then TGRAD ← -1
IF (TCF6 is "N"), then TGRAD ← 0
IF (TCF6 is "Y"), then TGRAD ← 1
```

(5) Special rules for TERNCRED, PCRED.1-PCRED.6, TOTGPA, GPA.1-GPA.6 and TRFIND

```
IF(TCF8 = 0), then set the variables as follows:

     TERNCRD ← 0

     TOTGPA ← -1

     TRFIND ← 0

     PCRED.i ← -1 (for i ← 1, ..., 6)

     GPA.i ← -1 (for i ← 1, ..., 6)
```

Otherwise, these variables were computed on the basis of entries for TCF10.

---

[28] Recall that transcript data were also used to augment student questionnaire data in some cases (Subsection VI.A.2.d).

Table E.20

STUDENT VARIABLES OBTAINED FROM TRANSCRIPTS

Mnemonic	Variable Description
MAJOR	Reported college major
ACPROB	Indicator of having been placed on academic probation
ACDIS	Indicator of having been academically dismissed
TGRAD	Indicator of completion of course of study
TERNCRD	Total earned undergraduate credits (scaled to quarter hours)
PCRED.1	Proportion of total earned credits in education and related fields
PCRED.2	Proportion of total earned credits in humanities
PCRED.3	Proportion of total earned credits in other nonscientific academic fields
PCRED.4	Proportion of total earned credits in social sciences
PCRED.5	Proportion of total earned credits in natural sciences, engineering, and related scientific fields
PCRED.6	Proportion of total earned credits in trade and related nonacademic fields
CAEMP	Content area of emphasis (surrogate measure for college major)
RELCRED	Credits earned relative to normal progression
TOTGPA	Total GPA (at school last attended)
GPA.1	GPA (at school last attended) for courses taken in education and related fields
GPA.2	GPA (at school last attended) for courses taken in humanities
GPA.3	GPA (at school last attended) for courses taken in other nonscientific academic fields
GPA.4	GPA (at school last attended) for courses taken in social sciences
GPA.5	GPA (at school last attended) for courses taken in natural sciences, engineering, and related scientific fields
GPA.6	GPA (at school last attended) for courses taken in trade and related nonacademic fields
TRFIND	PSE transfer indicator

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(6) Establishing the Value of TRFIND

For all of seven potential content areas, all 3-tuples of information (standard code, # credits A, # credits B) were examined and if any value of # credits B was other than 0 or blank and was associated with a standard code other than 40, then TRFIND ← 1; otherwise TRFIND ← 0.

(7) Establishing the Value of TERNCRD and PCRED.1-PCRED.6

In computing these variables, a matrix, X, was constructed and initialized to 0 as defined in Table E.21. The columns of the matrix were defined by the various content areas (CA) and specified totals and subtotals. The rows of the table were defined by the nature of the standard codes (1st value in the CA 3-tuple entries) or by the subtotal of several code groupings. The computed elements within rows 1-3 were the sum of credits, from column A (second value of 3-tuple) and column B (third value of 3-tuple), within the appropriate standard code row category and the appropriate column content area (CA)--with appropriate row subtotals and totals. The computed entries of row 4 were the sums (within CA) of the entries in rows 1-3. The computed elements of row 5 were: 1 if any standard code of 40 is encountered within the corresponding column CA, and 0 otherwise. Totals and subtotals of these {0,1} indices were computed as indicated.

Table E.21

ROW AND COLUMN DESIGNATION FOR THE MATRIX X

	Col.1 CA1	Col.2 CA2	Col.3 CA3	Col.4 CA4	Col.5 CA5	Col.6 CA6	Col.7 Sub-total	Col.8 CA7	Col.9 Total
Row 1: 30 codes									
Row 2: 0 codes									
Row 3: 0<codes <30									
Row 4: Total of 1st 3 rows									
Row 5: 40 code indicator									

```
(a) If($X_{4,9}$.EQ.0), then

    If($X_{5,9}$.EQ.0), then error;

    Otherwise,
        TERNCRED ← -1,
        TOTGPA ← -1,
        GPA.i ← -1, for i ← 1, ..., 6,
        Ignore GPA step, and

        If ($X_{5,7}$.EQ.0), then

            PCRED.i ← -1, for i ← 1, ..., 6;

        Otherwise

            PCRED.i ← $X_{5,i}/X_{5,7}$ , for i ← 1, ..., 6.

(b) If(($X_{4,9}$.GT.0).AND.(($X_{1,9}$ + $X_{3,9}$).EQ.0)), then

    TERNCRED ← 0, and

    If($X_{4,7}$.EQ.0), then

        PCRED.i ← -1, for i ← 1, ..., 6, and
        Go to GPA step.

    Otherwise,

        PCRED.i ← $X_{4,i}/X_{4,7}$ , for i ← 1, ..., 6, and

        Go to GPA step.

(c) Otherwise--{(($X_{4,9}$.GT.0).AND.(($X_{1,9}$ + $X_{3,9}$).GT.0))}

    TERNCRED ← f{$X_{1,9}$ + $X_{3,9}$}[29], and

    If($X_{4,7}$.EQ.0), then

        PCRED.i ← -1, for i ← 1, ..., 6, and
        Go to GPA step.

    Otherwise,

        PCRED.i ← $X_{4,i}/X_{4,7}$ , for i ← 1, ..., 6, and

        Go to GPA step.
```

(8) Establishing the Value of TOTGPA and GPA.1-GPA.6

In computing these variables, first a matrix, Y, was constructed and initialized to 0 as defined in Table E.22. The columns of

---

[29] If TCF5 = Q, then f(x) = x; if TCF5 = S, then f(x) = R{1.5 * X}, where R(y) = y rounded to the next highest integer value.

Table E.22

ROW AND COLUMN DESIGNATION FOR THE MATRIX Y

	CA1	CA2	CA3	CA4	CA5	CA6	Sub-Total	CA7	Total
Row 1: 30 code credits									
Row 2: Credits for 0 ± Codes < 30									
Row 3: Credits * Codes for 0 ≦ Codes < 30									
Row 4: 40 code indicator									

matrix Y were identical to those previously described for matrix X. The rows of Y defined particular functions of the standard codes (1st value in the CA 3-tuple entries). Letting the 3-tuples for a given CA be represented by a 3-valued vector, Z, then the CA-specific elements of Row 1 were computed over the j 3-tuples within a content area as

$$\sum_j I_j Z_{2,j} ,$$

$$\text{where } I_j = \begin{cases} 1, \text{ if } Z_{1,j} = 30, \\ 0, \text{ otherwise.} \end{cases}$$

The CA-specific elements of Row 2 were computed as

$$\sum_j H_j Z_{2,j} ,$$

$$\text{where } H_j{}^{30} = \begin{cases} 1, \text{ if } 0 \leqq Z_{1,j} < 30, \\ 0, \text{ otherwise.} \end{cases}$$

The CA-specific elements of Row 3 were computed as:

$$\sum_j H_j Z_{1,j} Z_{2,j} .$$

---

[30] This is not necessarily 1-I.

The CA-specific elements of Row 4 were computed as:

$$Q\{\sum_j (Z_{1,j} = 40)(Z_{2,j} > 0)\},$$

$$\text{where } Q(x) = \begin{cases} 0, \text{ if } x = 0, \\ 1, \text{ if } x > 0. \end{cases}$$

Finally, the subtotals and totals were taken over the specified CA's, within a row.

Given the matrix, computations were carried out as follows.

(a) <u>TOTGPA</u>

```
If(($Y_{1,9} + Y_{2,9}$).EQ.0), then
    TOTGPA ← -1
    GPA.i ← -1, for i ← 1, ..., 6, and
    DO NOT go to GPA.i step
Otherwise (i.e., (($Y_{1,9} + Y_{2,9}$).GT.0))
(i)  If(($Y_{1,9}/(Y_{1,9} + Y_{2,9}$)).GE.0.30), then
    TOTGPA ← -1
    GPA.i ← -1, for i ← 1, ..., 6, and
    DO NOT go to GPA.i step
(ii) If((($Y_{1,9}/(Y_{1,9} + Y_{2,9}$)).GE.0.10).AND.(($Y_{1,9}/(Y_{1,9} + Y_{2,9}$).LT.0.30))), then
        TOTGPA ← $\left[\frac{Y_{3,9} + Y_{1,9}*10}{5*(Y_{2,9} + Y_{1,9})}\right]$ , and
        Go to GPA.i step
(iii) If(($Y_{1,9}/(Y_{1,9} + Y_{2,9}$)).LT.0.10), then
        TOTGPA ← $\left(\frac{Y_{3,9}}{5*Y_{2,9}}\right)$ , and
        Go to GPA.i step
```

(b) <u>GPA.i</u>

```
If((($Y_{1,8} + Y_{2,8})/(Y_{1,9} + Y_{2,9}$)).GE.0.25), then
    GPA.i ← -1, for i ← 1, ..., 6
```

```
Otherwise, for i ← 1, ..., 6;
    (1) If($Y_{2,i}$.EQ.0), then
            If(($Y_{1,i}$.EQ.0).AND.($Y_{4,i}$.EQ.0).AND.(($Y_{1,8}$ + $Y_{2,8}$).EQ.0),
            then
                GPA.i ← -3
            Otherwise,
                GPA.i ← -1
    (2) If($Y_2$,i.GT.0), then
            (i) If(($Y_{1,i}$/($Y_{1,i}$ + $Y_{2,i}$)).GE.0.30), then
                    GPA.i ← -1
            (ii) If((($Y_{1,i}$/($Y_{1,i}$ + $Y_{2,i}$)).LT.30).AND.
                 (($Y_{1,i}$/($Y_{1,i}$ + $Y_{2,i}$)).GE.0.10)), then
                    GPA.i ← $\left[\frac{Y_{3,i} + Y_{1,i}*10}{5*(Y_{2,i} + Y_{1,i})}\right]$
            (iii) If(($Y_{1,i}$/($Y_{1,i}$ + $Y_{2,i}$)).LT.0.10), then
                    GPA.i ← $\left(\frac{Y_{3,i}}{5*Y_{2,i}}\right)$
```

(9) <u>Computing the Value of RELCRED</u>

The variable RELCRED was computed using the variable TERNCRED and entries for SFUQ11 as follows:

```
IF(TERNCRED.EQ.-3), then RELCRED ← -3;
IF(TERNCRED.EQ.-1), then RELCRED ← -1;
Otherwise,
    Let
        $N_1 = \sum_{\omega \epsilon A_1}$ (SFUQ.11.$\omega$ > 2);
        $N_2 = \sum_{\omega \epsilon A_2}$ (FFUQ.11.$\omega$ > 2);
```

where

$$A_1 = \{b,c,d,f,g,h,j,k,\ell,n,o,p,r,s,t,v\},$$

and

$$A_2 = \{a,e,i,m,q,u\}.$$

Then,

```
If ((N1.EQ.0).AND.(N2.EQ.0)), then
     RELCRED ← -1;
Otherwise,
     RELCRED ← $\frac{\text{TERNCRED}}{N_1*15 + N_2*7}$
```

(10) Computing the Value of CAEMP

The variable CAEMP was developed from empirical rules determined from an examination of the pattern of PCRED.1 through PCRED.6 for those individuals for whom MAJOR was defined. The specific algorithm used was provided by USOE/OED. These rules are given below; however, the variable CAEMP was not used in any analyses reported since it was not sufficiently related to MAJOR.

```
IF(MAJOR is determinate), then CAEMP ← MAJOR
Otherwise,
     IF(PCRED.1 is indeterminate), then CAEMP ← -1;
     Otherwise,
          Determine a six-valued vector Z,
          where $Z_i = \begin{cases} 1, \text{ if (PCRED.i.EQ.}\max_j\text{(PCRED.j));} \\ 0, \text{ otherwise;} \end{cases}$
          and let $L = \sum_{j=1}^{6} (Z_i)10^{j-1}$.
          CAEMP was determined on the basis of L as follows:
```

Value of CAEMP	Value of L
1	1, 11, 111, 1011, 11010, or > 110000
2	10
3	100, 110, 1100, 1110, 10100, or 100011

Value of CAEMP	Value of L
4	1000, 1001, 1010, 1101, or 1111
5	10000, 10001, 10010, 10110, 11000, 11001, 11011, 11100, or 11110
6	100000 or 110000

3. SFUQ Student Variables

The variables considered in this section are subsumed under conceptual variables 1-7 and 9-18 of Table E.16. The specific variables that were extracted from the SFUQ (either directly or in combination with SMF data) are listed in Table E.23, with some indication as to their meaning. Details of the operationalization of these variables have been provided separately[31] and are not given here.

The number of student variables listed in Table E.23 is large but was not considered excessive. Moreover, the variables were seen to be sufficiently distinct, conceptually, to stand alone. Further, specific variables were related to specific analysis questions; and, while the variables may be related, it should be recognized that the analysis questions are also related. For these reasons, additional data reduction procedures (principal components approaches or nonmetric multidimensional scaling) seemed unwarranted.

VIII. DATA QUALITY

This section describes the quality of the data that were collected during the course of the second follow-up study. While response rates and sample coverage define the upper limits of data quality, two related problems of data quality that are typically present in questionnaire surveys are: (a) partial data sets, introduced by incomplete, inconsistent, or otherwise indeterminate responses on returned questionnaires, and (b) questionable validity of responses. The various data processing checks and the data quality indicators used in this study (see Subsection VI.A above) provided a ready avenue for investigating data indeterminacy. The receipt of duplicate returns from a subset of individuals (due to overlapping data collection steps) provided a means of examining the reliability of responses. In addition, a limited inter-coder reliability study was performed for the coding process applied to student transcripts.

The section is divided into four subsections, each dealing with a separate data quality problem. Subsection A discusses data obtained from the second follow-up questionnaire and from the base-year data base; Subsection B discusses data derived from an external data file containing institutional indices; Subsection C presents the results of an investigation of follow-up data reliability; and Subsection D presents the results from the reliability study applied to the student transcript data.

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[31] Burkheimer, G. J., *et al.*, March 1979 (*op. cit.*)

Table E.23

STUDENT VARIABLES OBTAINED FROM THE SECOND FOLLOW-UP QUESTIONNAIRE

Conceptual Variable	Mnemonic	Variable Description
Pattern of UB Participation	UBPAT1[a]	Five-valued pattern of UB participation--grades in which participated--
	UBPAT2[a]	Alternate three-valued pattern of UB participation (nonparticipant, typical, atypical)
Educational Progress/Persistence		
(High School Completion)	EDHS2+[a]	Progress/persistence through high school graduation, or beyond
(Postsecondary Entry)	PENS2[a][b]	Progress/persistence through post-secondary entry
(Postsecondary Graduation)	GRAD[c]	Progress/persistence through post-secondary graduation, licensing, or certification, conditional on school last attended
	PERG[c]	Progress/persistence attendance ratio related to expressed educational goal
	GSCH[d]	Progress/persistence through graduate school entry
	NOTRM[c]	Number of terms enrolled in PSE
	CENRG[c]	Persistence as reflected in either current enrollment or PSE graduation
	CENRG+[c]	Persistence as reflected in either current enrollment, PSE graduation, or intent to continue
	FTPT[c]	Persistence as reflected in intensity (full-time, part-time) of PSE exposure
	SUMSCH[c]	Persistence as reflected in intensity (proportional summer school enrollments) while in PSE

(continued)

Table E.23

(continued)

Conceptual Variable	Mnemonic	Variable Description
Educational Discontinuity		
(Lag entry to PSE)	LENT2[c]	Delay in entering PSE after high school
(Transfer from two-year to four-year institution	PCHNG[d]	Transfer from non-4-year to 4-year school after PSE entry
Amount and Type of Financial Aid Package	AIDTYP.1-AIDTYP.15[c]	Receipt of 15 specific types of support
	AIDAMT.1-AIDAMT.3[c]	Amount of support received from three general areas: grants, loans, work
	AIDCAT.1-AIDCAT.3[c]	Receipt of support from three general areas
	AIDPAK[c]	Index of pattern of total financial aid package
	AIDAL[c]	Percent of desired total aid to be received from loans and work study
Educational Expectations	EDEXP	Highest education expected
Educational Aspirations	EDASP2	Highest education desired
Deterrents to Educational Progress	EDDET2.A-EDDET2.H	Extent of problems experienced in eight specific areas of potential deterrence
Availability of Services and Programs	GAVAIL.1-GAVAIL.3[c]	Availability during PSE exposure of three general types of services/programs
Utilization of Service and Programs	GPART.1-GPART.3[c]	Extent of use of any of three available types of services/programs, given availability
Adequacy of Financial Assistance	AIDAD1.A-AIDAD1.E[c]	Stated adequacy of five categories of assistance

(continued)

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Table E.23

(continued)

Conceptual Variable	Mnemonic	Variable Description
Current Work Status	WORK2	Present employment status
Satisfaction with Quality of Life	SATIS	Expressed extent of satisfaction with current circumstances

[a] Previously collected data from SMF was also used in developing these variables.

[b] This variable is applicable only for those sample members who graduated from high school.

[c] These variables are applicable only for those sample members who have entered some form of PSE.

[d] This variable is applicable only for those sample member who: (1) were twelfth graders in 1973-74 and (2) graduated from a four-year PSE institution.

[e] This variable is applicable only for those sample members who attended a two-year PSE institution.

A. Follow-Up Questionnaire Data Quality

The follow-up questionnaire consisted of 16 items,[32] many of which had multiple parts. Questionnaires were collected by mail, telephone, and in some cases from sources other than students. Table E.24 details the resulting data quality, showing the extent of questionable or indeterminate data in the final data base. Data problems that are internal to the questionnaire (e.g., missing data and internally inconsistent responses), plus those that were "fixed" through logical imputations, are seen to be well within normal limits; in fact, they are typically quite low relative to similar surveys. Given the manual fail edit checks for inconsistency and completeness and subsequent attempts at telephone resolution, the minimal nature of such problems was not surprising.

Data availability of variables from the Student Master File has been previously documented in the base-year[33] and first follow-up[34] reports. The

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[32] For Form A, only 15 of these items were presented.

[33] Burkheimer, G. J., Levinsohn, J. R., Koo, H. P., and French, A. M. Evaluation Study of the Upward Bound Program (Volume IV of A Study of the National Upward Bound and Talent Search Programs). (Four Volumes). Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, April 1976. (ED 131-152)

[34] Burkheimer, G. J., French, A. M., Levinsohn, J. R., and Riccobono, J. A. Evaluation Study of the Upward Bound Program: A First Follow-up. Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, September 1977.

Table E.24

DATA QUALITY FOR SECOND FOLLOW-UP QUESTIONNAIRE ITEMS AND VARIABLES

Questionnaire Item	Missing or Otherwise Indeterminate Data	Imputed Data	Inconsistent Data	Total Problems[a]	
Q1	0	0	37	37	(.9)
Q2	4	0	119	121	(2.9)
Q3	51	0	-	51	(1.2)
Q4	72	0	-	72	(1.7)
Q5.1 → Q5.8	527	0	-	527	(12.4)
Q5.9 → Q5.12	526	0	-	526	(12.3)
Q5.13 → Q5.15	630	0	-	630	(14.8)
Q5.16	786	0	-	786	(18.4)
Q5.17	572	0	-	572	(13.4)
Q5.18	713	0	-	713	(16.7)
Q6.A	414	44	-	458	(10.7)
Q6.B	414	196	-	610	(14.3)
Q6.C	417	157	-	574	(13.5)
Q6.D	425	203	-	628	(14.8)
Q6.E	469	34	-	503	(11.8)
Q7.A	545	11	-	556	(13.1)
Q7.B	545	94	-	639	(15.0)
Q7.C	545	62	-	607	(14.3)
Q7.D	545	115	-	660	(15.5)
Q8	49	0	-	49	(1.1)
Q9.1	61	50	-	111	(2.6)
Q9.2	61	20	-	81	(1.9)
Q9.3	61	4	-	65	(1.5)
Q9.4	61	17	-	78	(1.8)
Q9.5	61	34	-	95	(2.2)
Q9.6	61	44	-	105	(2.4)
Q9.7	61	4	-	65	(1.5)
Q10.A	353	22	-	375	(8.8)

(continued)

Table E.24
(continued)

Questionnaire Item	Missing or Otherwise Indeterminate Data	Imputed Data	Inconsistent Data	Total Problems[a]	
Q10.B	354	17	-	371	(8.7)
Q10.C	349	23	-	372	(8.7)
Q10.D	351	15	-	366	(8.6)
Q10.E	359	15	-	374	(8.8)
Q10.F	349	16	-	365	(8.6)
Q10.G	375	37	-	412	(9.7)
Q10.H	388	33	-	421	(9.9)
Q10.I	376	32	-	408	(9.6)
Q10.J	374	35	-	409	(9.6)
Q10.K	365	33	-	398	(9.3)
Q10.L	377	34	-	411	(9.6)
Q10.M	349	22	-	371	(8.7)
Q11.A	84	131	-	215	(5.0)
Q11.B	80	12	-	92	(2.2)
Q11.C	81	16	-	97	(2.3)
Q11.D	81	17	-	98	(2.3)
Q11.E	84	138	-	222	(5.2)
Q11.F	77	27	-	104	(2.4)
Q11.G	66	31	-	97	(2.3)
Q11.H	82	29	-	111	(2.6)
Q11.I	82	123	-	205	(4.8)
Q11.J	79	43	-	122	(2.9)
Q11.K	79	40	-	119	(2.8)
Q11.L	81	48	-	129	(3.0)
Q11.M	86	100	-	186	(4.4)
Q11.N	80	56	-	136	(3.2)
Q11.O	81	59	-	140	(3.3)

(continued)

Table E.24
(continued)

Questionnaire Item	Missing or Otherwise Indeterminate Data	Imputed Data	Inconsistent Data	Total Problems[a]	
Q11.P	83	60	-	143	(3.4)
Q11.Q	88	99	-	187	(4.4)
Q11.R	85	64	-	149	(3.5)
Q11.S	84	66	-	150	(3.5)
Q11.T	84	67	-	151	(3.5)
Q11.U	93	103	-	196	(4.6)
Q11.V	88	73	-	161	(3.8)
Q12.1	525	342	178	1,045	(24.5)
Q12.2	920	0	178	1,098	(25.8)
Q13	81	0	-	81	(1.9)
Q14	423	0	-	423	(9.9)
Q15.A	65	0	-	65	(1.5)
Q15.B	66	0	-	66	(1.5)
Q15.C	66	0	-	66	(1.5)
Q15.D	65	0	-	65	(1.5)
Q16.A	424	35	-	459	(10.8)
Q16.B	425	31	-	456	(10.7)
Q16.C	424	26	-	450	(10.6)
Q16.D	427	59	-	486	(11.4)
Q16.E	427	57	-	484	(11.4)
Q16.F	424	44	-	468	(11.0)
Q16.G	425	29	-	454	(10.6)
Q16.H	426	31	-	457	(10.7)

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[a] Values given in parentheses represent the percentage of cases with data problems; using as a base the 4,262 cases for which some questionnaire data was available.

availability of the relevant data items among the 4,264 sample members for whom second follow-up questionnaire data were obtained is presented in Table E.25. It is clear that the rates are quite satisfactory, and in only two instances do they fall below 99 percent.[35]

B. Availability of PSE Institutional Data

A second data set consists of the data obtained on PSE institutions. As indicated previously, the PSE indices were obtained from an external data file made available by USOE. Table E.26 presents the rates of available PSE institutional information (for those variables used in analysis) for the 3,022 second follow-up respondents who reported the name of their last attended institution. Among these, the only variable on which information was not completely available was institutional cost which was missing for less than 3 percent of these cases.[36]

C. Availability of Student Transcript Information

The availability of student transcript information is detailed in Table E.27. Of the 21 variables computed from each transcript, 7 were available for fewer than 88 percent of all cases. These 7 included the 6 individual content area GPAs and the classification of major field of study. With respect to the first group of these items, lack of availability should come as no surprise since GPA within an area is defined only for those who had earned credits within that area. In the case of major, some unavailability was expected since not all sample members had been in school long enough to reach the stage at which such a classification of effort was meaningful. In addition, many of the two year schools attended by sample members failed to classify students as to major course of study. These factors resulted in fewer than half the transcripts providing this information.

D. Data Reliability

Due to overlapping data collection activities, duplicate returns were received for 104 individuals.[37] These duplicate returns provided a natural vehicle for an examination of the reliability of the returned data.

The variables have been divided into two sets for reporting purposes. The first set contains those variables which are strictly categorical in nature for which a consistency index was calculated based on agreement of response across questionnaires. This information is set forth in Table E.28. The consistency indices for four of these items exceeded .90 (questions 1, 13, 15C, and 15D). Indices for five other items were between .70 and .90 (questions 3, 6E, 8, 15A, and 15B). Indices for the remaining six items were between .50

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[35] Greater indeterminacy of poverty status had been observed in previous studies; the greater indeterminacy of AGE GRADE is due primarily to age indeterminacy, which was observed in previous studies.

[36] In actuality, this figure represents the true availability of data for the first six indices listed; however, for these other indices the missing information was imputed.

[37] The subset of individuals with duplicate returns does not, of course, represent a random or necessarily representative sample of respondents.

Table E.25

AVAILABILITY OF MAJOR CLASSIFICATION VARIABLES FROM STUDENT MASTER FILE

Variable	Percent of Cases Available
SEXC	99.92
RACEC	99.19
POVSC	94.31
RISKC	99.75
GRADE	100.00
AGE|GRADE	93.62

Table E.26

AVAILABILITY OF PSE INSTITUTIONAL INDICES

Variable	Number of Cases with Data	Percent
IOFCON	3,022	100.0
ISES	3,022	100.0
ISEL	3,022	100.0
ICOST	2,942	97.4
ISIZ	3,022	100.0
IRACE	3,022	100.0
UBHOSTC	3,022	100.0
SSHOSTC	3,022	100.0

Table E.27

AVAILABILITY OF TRANSCRIPT INFORMATION

Variable	Number of Cases With Available Data	Percent
MAJOR	977	42.3
ACPROB	2,310	100.0
ACDIS	2,310	100.0
TGRAD	2,191	94.8
TERNCRD	2,169	93.9
PCRED.1-6[a]	2,222	96.2
CAEMP	2,163	93.6
RELCRED	2,168	93.9
TOTGPA	2,037	88.2
GPA.1	693	30.0
GPA.12	1,740	75.3
GPA.13	1,426	61.7
GPA.14	1,547	67.0
GPA.15	1,571	68.0
GPA.16	958	41.5
TRFIND	2,310	100.0

NOTE: Percentages are based on the 2,310 cases for which transcripts were available.

[a] Represents six variables.

Table E.28

RESPONSE CONSISTENCY ASSOCIATED WITH CATEGORICAL SECOND FOLLOW-UP QUESTIONNAIRE ITEMS

Item	Consistency Index[a]	Item	Consistency Index
Q1	.96 (99/103)	Q12A	.55 (40/73)
Q3	.75 (50/67)	Q12B	.52 (33/63)
Q6A	.55 (28/51)	Q13	.96 (94/98)
Q6B	.57 (28/49)	Q15A	.83 (35/42)
Q6C	.59 (30/51)	Q15B	.88 (37/42)
Q6D	.57 (27/47)	Q15C	.98 (41/42)
Q6E	.70 (37/53)	Q15D	.98 (41/42)
Q8	.72 (49/68)		

[a] This consistency index is the proportion of cases for which both available responses were identical and, as such, does not include in its computation any cases missing information on a particular variable.

and .70 (questions 6A, 6B, 6C, 6D, 12A, and 12B). In general, the items with the highest consistency index are the most objective, while those with the lowest are the most subjective.

The second set contains those variables which are dichotomous or quasi-continuous in nature. The reliability indices which were estimated for these variables are set forth in Table E.29. Estimated reliability indices for eight of the variables were in excess of .80; two reliability estimates were less than .40, and for the remaining variables, reliabilities were between .45 and .75. Given the nature of the data collection process, such results are not unexpected.

E. Reliability of Data Coded From Student Transcripts

While the information on student transcripts was reliable, by definition, the encoding process was expected to introduce some error into results. An important aspect in the application of the transcript coding process was the extent of agreement among raters in encoding the available data according to the rules provided. To examine this facet of transcript coding, a coder reliability study was performed.

In the present instance, reliability refers to the ratio of true to total variance and, as such, corresponds to the notions underlying "classical" reliability theory as expressed by Magnusson.[38] The fundamental problem is

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[38] Magnusson, David. Test Theory. Reading, Massachusetts: Addison-Wesley Publishing Company, 1966.

Table E.29

RELIABILITY INDICES ASSOCIATED WITH NON-CATEGORICAL SECOND FOLLOW-UP VARIABLES

Variable	Reliability Estimate[a]	Variable	Reliability Estimate
Q2	.90	GAVAIL3	.65
SGCAT	.84	GPART1	.72
LCAT	.61	GPART2	.65
ESCAT	.67	GPART3	.67
Q5.16	.25	Q11.1	.47
Q5.17	.48	Q11.2	.71
Q5.18	.91	Q11.3	.81
Q7A	.51	Q11.4	.66
Q7B	.51	Q11.5	.90
Q7C	.36	Q11.6	-- [b]
Q7D	.57	Q14	.72
Q9A	.86	Q16A	.52
Q9B	.85	Q16B	.64
Q9C	-- [b]	Q16C	.66
Q9D	.45	Q16D	.69
Q9E	.63	Q16E	.55
Q9F	.91	Q16F	.65
Q9G	-- [b]	Q16G	.60
GAVAIL1	.65	Q16H	.46
GAVAIL2	.65		

[a] $\hat{r} = \frac{MS_S - MS_E}{MS_S + MS_E}$, where MS_S = mean square for subjects, and MS_E = mean square for error.

[b] Indices for these items were not calculated because no "true" variance was present in the sample of responses obtained.

the identification and estimation of true variance. The approach taken called for a design in which the same five sampled transcripts (representing four unique PSE institutions) were processed by each of the eleven coders used in the actual processing of these data, yielding a fully crossed design for each transcribed variable as indicated in Table E.30.

Within this design, the data considered were the analytic variables constructed from the TCF entries, rather than the raw entries themselves; data were analyzed separately for each analysis variable that was constructed, employing a standard two-way analysis of variance (ANOVA). The general form of the analysis, as it applies to each variable, is given in Table E.31.[39]

Table E.30

CROSSED DESIGN FOR DETERMINING CODER RELIABILITY

	Transcripts				
Coders	1	2	3	4	5
1					
2					
⋮					
11					

Since the only "true" variance in the model defined in Table E.31 is represented by the variance due to transcripts (σ_T^2), an expression for the ratio of this variance to the total variance is needed for an estimate of the reliability of each variable. In considering a similar situation Ebel[40] proposed an estimate for the reliability of ratings:

$$\hat{r} = \frac{MS_T - MS_{TC}}{MS_T + (k-1)\,MS_{TC}} ,$$

for which the mean square terms are those defined in Table E.31 and k is the number of raters involved. Substituting the expected values of the mean squares as set forth in the ANOVA table, this formula simplifies to the ratio of σ_T^2 to $\sigma_T^2 + \sigma_{TC}^2 + \sigma_C^2 + \sigma_{R:TC}^2$.

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[39] Glass, Gene V. & Stanley, Julian C. Statistical Methods in Education and Psychology. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1970.

[40] Ebel, Robert L. Estimation of the Reliability of Ratings. Psychometrika, 1961, 16, 407-424.

Table E.31

ANOVA TABLE

Source of Variance	Degrees of Freedom (df)	Sum of Squares (SS)	Mean Square (MS)	Expected Mean Square (E [MS])
Trancript	4	SS_T	MS_T	$\sigma^2_{R:TC} + \sigma^2_{TC} + 11\sigma^2_T$
Coder	10	SS_C	MS_C	$\sigma^2_{R:TC} + \sigma^2_{TC} + 5\sigma^2_C$
Transcript x Coder	40	SS_{TC}	MS_{TC}	$\sigma^2_{R:TC} + \sigma^2_{TC}$

where $\sigma^2_{R:TC}$ is the variance associated with replications within transcripts and coder cells (not estimable within this design)

σ^2_{TC} is the variance associated with the transcript-coder interaction

σ^2_T is the variance associated with the transcript effect, and

σ^2_C is the variance associated with the coder effect.

The appropriate mean squares and the estimates of the reliability of the continuous and dichotomous variables derived from the transcript coding process are provided in Table E.32. It should be pointed out that these are point estimates based on a sample of only five transcripts and that the standard errors of these estimates are probably quite large as a result. Nonetheless, the estimates provide a starting point for consideration of potential problem areas in implementing the coding process.

In general, the simple dichotomous variables (Indicator of Credit Type, Indicator of Academic Problem, Indicator of Academic Dismissal, Indicator of Completion of Course of Study, and Indicator of Presence of Transfer Credits) show greater estimated reliability than the continuous variables. The reliabilities for the former group of variables range from .77 to 1.00, while those for the latter vary between .10 and .98, and about half of these reliabilities are less than .77. Since the dichotomous variables result from a considerably simpler coding task, this finding comes as no surprise; in fact, it is somewhat surprising that these variables were not more reliably determined (although the reliabilities are generally acceptable).

The major continuous analysis variables, total earned credits and overall GPA, were both measured with reasonably high estimated reliability, .86 and .97 respectively. These constructs show considerable variability in estimated

Table E.32

RESULTS OF THE TRANSCRIPT CODING RELIABILITY STUDY

Description of Variable	MS_T	MS_{TC}	$\hat{r}$
Indicator of Academic Problems[a]	2.1182	.0182	.91
Indicator of Academic Dismissal[a]	1.8182	.0182	.90
Indicator of Completion of Course of Study[a]	2.3636	.0636	.77
Indicator of Presence of Transfer Credits	2.0636	.0436	.81
Indicator of Credit Type[a]	3.3000	0.0000	1.00
Total Earned Credits	8627.8000	126.1500	.86
Credits in Area 1[b]	154.5636	8.4636	.61
Credits in Area 2[b]	3031.5000	21.2800	.93
Credits in Area 3[b]	751.6818	41.4218	.64
Credits in Area 4[b]	1553.5000	34.7100	.80
Credits in Area 5[b]	8456.8453	16.3555	.98
Credits in Area 6[b]	77.2455	35.4055	.10
Overall Grade Point Average	2.5659	.0070	.97
GPA in Area 1	49.1902	3.3767	.55
GPA in Area 2	8.0426	.0236	.97
GPA in Area 3	43.1286	2.8545	.56
GPA in Area 4	11.1201	.3978	.71
GPA in Area 5	9.7569	.2552	.77
GPA in Area 6	42.4605	3.1186	.53
Indicator of Major Field 1	.4545	.0545	.40
Indicator of Major Field 2	0.0000	0.0000	.00
Indicator of Major Field 3	1.7455	.0355	.81
Indicator of Major Field 4	.0182	.0182	.00
Indicator of Major Field 5	.4545	.0545	.40
Indicator of Major Field 6	.0182	.0182	.00

(continued)

Table E.32

(continued)

Description of Variable	MS_T	MS_{TC}	$\hat{r}$
Categories of Response to Other Certificates, Licenses, Diplomas, or Degrees Earned:			
Cannot Determine	2.0727	.0327	.85
Certificate	0.0000	0.0000	--
License	0.0000	0.0000	--
Vocational/Technical Degree	.1545	.0545	.14
Two Year Academic Degree	1.1091	.0691	.58
Bachelor's Degree	0.0000	0.0000	--
Academic Attendance History:[c]			
Number Terms Not in School	200.0273	7.3973	.70
Number Terms in High School	0.0000	0.0000	--
Number Terms in Vocational/Technical School	0.0000	0.0000	--
Number Terms in Two Year College	84.5455	.3755	.95
Number Terms in Four Year College	233.5909	2.4209	.90

[a] Binary-valued variables.

[b] Expressed as a proportion of total credits.

[c] Categories of Information Inferred and Information Obtained Directly have been collapsed. Estimated reliabilities for uncollapsed categories appeared to be generally unacceptable, indicating very poor consistency in attributing information to one of these two categories.

reliability, however, when classified by major content area. The proportion of credits earned in categories 2 (Humanities), 4 (Social Sciences), and 5 (Natural Science, Engineering, and related scientific fields) seem to have been determined with relative consistency; reliability estimates range from .80 for category 4 to .98 for category 5. The estimated reliabilities for categories 1 (education and related fields) and 3 (other non-scientific academic fields), however, are marginally acceptable at best (.61 to .64), and the estimated reliability for category 6 (trade and related non-academic fields) is unacceptable (.10).

The reliabilities of computed GPAs within content area display a narrower range (from .53 to .97) but can be divided into two groups. The acceptably reliable variables include GPAs in areas 2, 4, and 5 ($\hat{r}$ = .97, .71, and .77 respectively), while the remaining variables are considerably less reliable and cannot be considered acceptable.

Estimated reliabilities for the categories associated with Major Field were rather low. The highest estimate was obtained for the indicator of Major Field 3 (other non-scientific academic fields) with .81. Reliabilities for Fields 1 (education and related fields) and 5 (natural science, engineering, and related scientific fields) were only .40 each. The estimated zero reliabilities for Fields 4 and 6 are simply indicative of the coding errors associated with the first three fields, and no information was available for Field 2 at all.

Similar problems appeared to have been encountered with respect to the indication of certificates, licenses, diplomas, or degrees earned. The single most reliable category here was that of "cannot determine" with an estimate of .85. The only other two defined reliability estimates were for the categories of Two Year Academic Degree ($\hat{r}$ = .59) and Vocational/Technical Degree or Diploma ($\hat{r}$ = .14). Clearly, the lack of agreement among the raters with respect to these indicators was quite serious in the sample of five transcripts.

Finally, the question of reliability of the Academic Attendance History was addressed through counts of the number of times a particular category of attendance was circled over the 22 terms in question. Initial estimates obtained by maintaining the distinction between directly obtained and "inferred" data were quite poor, indicating the failure of the coders to reliably make this distinction. The figures reported in the table are for the counts in the five categories resulting from collapsing "directly obtained" and "inferred" information. In general, these were acceptable; for the three categories in which reliability was defined, two were at or above .90 (Two-Year College and Four-Year College) and one was .70 (Not in School). Given the intended use of this data to augment student responses, the obtained reliabilities were acceptable.

Appendix F

Transcript Coding Form and Instructions

This appendix contains the materials used in manually coding the student postsecondary academic transcripts that were collected in the institutional request survey. The appendix is organized as follows:

Section I: Instructions for Completing the Transcript Coding Form
Section II: Content Area Code List
Section III: Transcript Coding Form

I. INSTRUCTIONS FOR COMPLETING THE TRANSCRIPT CODING FORM

INSTRUCTIONS FOR COMPLETING THE TRANSCRIPT CODING FORM

General

The Transcript Coding Form (TCF) is the data collection instrument designed for use in this coding task. The items on the TCF pertain to various aspects of postsecondary educational activity and performance. Detailed instructions for completing each TCF item are provided below. Most of the item instructions are illustrated with specific examples. However, these examples are intended as aids to understanding the idea behind coding each item; they should not be treated as if they accounted for all possible instances of the item.

This is an unusually complicated coding task. It is impossible to anticipate every problem or situation that might arise and to specify in advance rules for handling it. In many cases you will have to use your own judgment, based on your general knowledge of what kind of information is desired and why. However, whenever you are unsure about what you should do, please ask. If you encounter a problem or situation that you feel is not covered by the instructions, stop and ask your supervisor for advice on how to proceed.

Preparing to Code a Transcript with the TCF

First, read through the instructions for coding the TCF and be sure you understand what is required for each item. After thoroughly reviewing the TCF and instructions, you should become familiar with the transcript you are going to code. Most (but not all) institutions provide (either as part of the transcript or as a separate information sheet) some descriptive material to aid in understanding their grading and credit system, course numbering system, and the various abbreviations, terms, and symbols which may appear on the student's record. Do not begin coding the transcript on the TCF items until you are familiar with both the TCF and the transcript to be coded.

Instructions for Completing the TCF

This section provides detailed instructions for completing each item on the TCF. Please read these instructions carefully and refer to them frequently when you are coding to be sure that you are assigning the correct code to every TCF item. Use only the codes indicated for each item; certain items allow blanks, others do not. FOLLOW THE INSTRUCTIONS!

Item 1: Student ID Number

This number will be written somewhere on the transcript (typically in felt-tip pen in the upper left-hand or right-hand corner). The number will be a maximum of four digits, followed by a letter, which is a computer check digit. The complete student ID number must be entered in the space beside Item 1; leading zeros and the alpha check digit should be coded. Also enter the student ID number in the top right hand corner of all remaining pages of the TCF. IMPORTANT: Be sure that you transcribe this information accurately.

Item 2: Major Field

Scan the transcript for a space in which major field of study is provided. If the student's major is not provided, leave Item 2 blank. If provided, determine the appropriate content area code (1 through 6) for this field from the "Content Area Code List" provided separately, and enter the code number in the space next to Item 2. For example: If the transcript indicates that the student's major field is (was) psychology, then you should enter "4" (i.e., the Content Area Code for Social Sciences) for Item 2 of the TCF.

Item 3: Academic Probation

Examine the transcript carefully for any indication that the individual was at any time placed on academic probation, or suspended for a finite period of time. (NOTE: Special probation automatically given to transfer students does *not* apply in this case.) If there is an indication that academic probation or suspension was instituted for the student, enter "Y" in the space next to Item 3; otherwise, leave Item 3 blank.

Item 4: Academic Dismissal

When applicable, some indication of academic dismissal usually (but not always) appears as one of the last entries on a transcript. If there is any indication on the transcript that the student was "dismissed" for academic reasons (even if he was later readmitted), enter "Y" in the space next to Item 4; otherwise, leave Item 4 blank.

Item 5: Credit Type

Determine if the school involved is on a "semester" or "quarter" system, i.e., assigns course credits in terms of semester hours or quarter hours. This is typically explicit in the specification of terms on the transcript (e.g., spring quarter 1976, or spring semester 1976). If the school is on a semester system, enter "S" in the space beside Item 5. If the school is on the quarter system, enter "Q" in the space next to Item 5. If it is impossible to determine whether the school is on a semester hour or quarter hour system, or if the transcript clearly indicates some other system (e.g., "clock hours"), then enter S in the space provided (these hours will all be given 40 codes in Item 10). Be sure to enter either an "S" or a "Q"; do not leave this item blank.

Item 6: Course of Study Completion

Scan the transcript to determine whether or not it indicates that the individual has graduated or completed his/her program of study at the institution. If so, then enter "Y" in the space next to Item 6. If it is obvious that the individual has not completed his course of study (has not earned enough credit to obtain a diploma or certificate of graduation), enter "N" in the space next to Item 6. If it cannot be determined to your satisfaction whether or not the individual has completed his or her major course of study, leave Item 6 blank.

Item 7: Certificates, Licenses, Degrees, or Diplomas Earned

If the information on the transcript indicates that the individual, at any time since high school, has received any license, certificate, etc. (of an academic nature) then circle all of the Item 7 response options 2 through 6 that apply; otherwise, circle option "1" (i.e., cannot determine) only. Note: If Option 1 is circled, then no other alternative should be circled.) Do not leave Item 7 blank.

Item 8: Number of Content Areas Coded

The entry next to Item 8 should be a number from zero to seven, reflecting the number of specific content areas represented on the individual's transcript. NOTE: Zero will be an appropriate entry only in those cases where the transcript (or simply a letter from the registrar) indicates that the student attended the institution for so short a time that no official record of the courses taken or grades received were kept.

In order to complete this item (and to assist, subsequently, in completing Item 10), you should:

(1) Go through the entire transcript and write the appropriate content area code (1 through 6, as indicated on the Content Area Code List) next to each of the courses taken by the individual. Note: It is best, where possible, to key on departmental offering in assigning content area codes to courses listed on the transcript. This is especially useful for courses listed as "Seminar," "General Methods," and the like. If, for example, these courses were offered by the Department of Education, they should be assigned to content area "1." On the other hand, if they were given by the Math Department, they should be assigned to content area "5." Try to assign all courses to one of the six content areas. Search the transcript for clues and use your judgment, but avoid pure guessing.

(2) After completing step (1) above, go through the transcript again and write "7" next to each of the courses that could not be classified into one of the six content areas. Content Area Code "7" has been established specifically for such unclassifiable cases. For example: If the transcript lists a course in "General Methods" and no department or other cues are available to suggest the appropriate content area, assign this course to content area "7."

Special Case: In some cases involving courses transferred from another institution, the transcript may indicate the total number of credits transferred but not the actual courses. In such cases, you should write in "7" on the transcript next to the total number of credits transferred, since it is impossible to identify the actual content area(s) for these transferred courses/credits.

(3) Simply count the number of different content area codes that you have assigned to the courses or credits listed on the transcript, and enter this number in the space provided next to Item 8 of the TCF.

It should be pointed out that the number entered for this item must equal the number of "Content Area Data Sheets" (i.e., the number of TCF Item 10 pages) that are completed for the individual. Thus, it is very important that Item 8 be completed correctly, since this number will be used by the data entry personnel to determine how many pages of Item 10 (Content Area Data Sheet) to expect. Do not leave this item blank.

Item 9: Academic Attendance History

Item 9 should be completed from the information provided on the transcript, to the extent possible. In completing this item, no more than one number on each line is to be circled; however, if the information required for a particular line (or time period) cannot be obtained directly or inferred adequately from the transcript, then do not circle any number on that line.

High School Attendance: Information as to when the individual completed high school can frequently be obtained directly from dates explicitly provided in the transcript. During that period of time, the individual was obviously attending high school, and for that period of time, Alternative 2 should be circled. Inferences may also be made for previous years of high school attended by assuming that the individual was in school during the academic year (i.e., fall, winter, and spring) and not in school during the summers. These assumed or inferred entries should be entered as "6"s or "7"s for the appropriate time periods.

Postsecondary School Attendance: Since the transcripts that you will be processing will be batched by institution, it is only necessary to determine from the separate list of postsecondary institutions that will be provided the type of postsecondary school that the institution represents (i.e., vocational-technical or business; 2-year college; 4-year college). During the time the individual was enrolled in the school from which the transcript was obtained, the appropriate alternative (3, 4, or 5, depending on the type of school) should be checked. Note: For a semester system, the fall semester includes both fall and winter of the year under consideration, and the spring semester includes both the winter and spring of the year under consideration. Thus, if a transcript from a four-year college indicates that the student was enrolled in the spring 1974 semester, you should circle "4" for row d and also circle "4" for row c.

For transfer students, the task becomes somewhat more difficult. In some cases, the transcript will indicate the exact semesters or quarters that the individual attended "other" institutions, prior to transferring to the institution in which he is currently or was last enrolled. In this case, the task will be quite simple. You will have to determine the type of school from the separately provided list and then simply circle the appropriate alternative (3, 4, or 5) for the periods of time in which the individual was at the previous school. More often, however, the transcript will indicate nothing more than that the individual was at some other school during a more broadly defined time period (e.g., from 1974 to 1976). In these cases, you will have to infer the actual times that the individual was in school (and circle the appropriate alternatives (8, 9, or 10) for each time period). As a rule of thumb, it is safe to assume, unless otherwise indicated, that the individual was at the previous school during the entire academic year, and not during the summers of the years under consideration. Additional clues as to how long the individual attended previous schools may be gained from the number of credits that are transferred. If, for example, it was indicated that an individual was at School X from 1974 to 1975, and he is transferring only three credits, it is fairly safe to assume that he was only there during the fall semester or quarter of that year. Special Case: The transcript may indicate that the student attended two different institutions during the same time period (e.g, a two-year college). In such cases, you should indicate his attendance at the higher level institution only.

Item 10: Content Area Code

A separate "Content Area Data Sheet" (i.e., Item 10 page) must be completed for each content area code represented by the courses listed on the individual's transcript. The number of these sheets that will have to be completed for a particular transcript is indicated by the number entered for Item 8 above (the procedure for determining this number was described previously under that item).

The procedure to be followed in completing Item 10 is the same for each content area. Specifically, each Content Area Data Sheet (Item 10 page) should be completed as described below.

First, enter the appropriate content area code (1 through 7) in the space provided next to Item 10. (For example, if "education" courses are listed on the student's transcript--and if they are, then you should have already written "1" next to each of these courses on the transcript (see Item 8 instructions)--enter a "1" in the space beside Item 10.) Next, complete columns A and B of the table for this content area as follows:

Column A (Number of Credit Hours at Last School Attended)

(1) Identify any courses in this content area for which the student has received a passing or satisfactory grade (i.e., "P" or "S") and has earned credits toward a degree but which are not included in the computation of his/her grade point average (i.e., there are no quality points associated with passing the course). Enter the total number of credit hours associated with all courses in this content area that were assigned such a grade in the space (under column A in the table) corresponding to the row designated "Passed." Draw a line through these courses and their corresponding grades and credit hours with a "magic marker," so that this information is not mistakenly included again in the other computations for this table. If no courses in the content area have received such a passing grade, then simply leave this space blank and proceed to the next grade (row) in the table.

(2) Repeat the procedure described in (1) above for the remaining grades A+ through "No Grade or Credit Reported" in the table. That is, identify all courses in the content area with a grade of A+, sum the credit hours associated with these courses, enter this total in the designated space under column A, and mark through the courses involved on the transcript. If there are no courses in this category, then leave this space blank. Repeat this procedure for courses given A, and so on.

Special Cases: Some problems (requiring special handling) may result from the presence of fail, withdrawal, and/or "ambiguous" grades given for courses listed on the student's transcript.

For example:

(a) Failing Grades: In many schools, if an individual receives a failing grade for a particular course (i.e., an "F" or "U"), the number of credit hours associated with that course is not listed or is listed as zero. In such cases, you will have to obtain or infer the number of credit hours attempted from other information on the transcript and, after doing so, record it in the appropriate space on the student's transcript. For example, if the student subsequently repeated the course or obtained a passing grade, then the number of credit hours will be recorded there and can be obtained directly. In other cases, the number of credit hours for the failed course can be deduced from the transcript's reported "total hours attempted," especially if this information is reported for each term. If these or similar approaches fail, then assume the "typical" credit hours assigned to similar courses (e.g., if the student failed English 101 and most other English and liberal arts courses on the transcript are three-credit courses, then assume English 101 is also a three credit-hour course.)

(b) WF (Withdrawal Failing), I (Incomplete), NR (Not Reported), H (Grade Held), or Similar Grades: These grades are to be treated in exactly the same manner as Fs or Us. Credit hours associated with courses receiving such grades in a particular content area should be included with those associated with "failed" courses in the area, and the total figure entered under Column A in the space corresponding to "Standard Code 0" on the Content Area Data Sheet.

(c) W or WP Grades (i.e., Withdrawal "Without" Penalty) and "Audits": Credits listed for courses receiving such grades are not to be entered on the Content Area Data Sheets.

(d) NC (No Credit) Grades: The procedure to be employed for such grades will be based upon other information on the individual's transcript. Specifically, you must ask yourself if the grade (1) carries "nonzero" credits and (2) enters into the student's GPA. If the answer to either one of these questions is yes, then the grade should be considered the same as an F and coded accordingly. However, if the answer to both questions is no, then the grade should be treated the same as a W (i.e., withdrawal without penalty) and excluded from further consideration.

(e) No Grade or Credit Reported: In such cases, you should simply enter "1" in columns A and B (on the appropriate Content Area Data Sheet) in the spaces allotted corresponding to Standard Code "40." Courses taken under a "clock hour" credit system should also be coded in this manner.

Column B (Number of Credit Hours Transferred)

The information in this column of the table should be completed only if the transcript indicates that the student has transferred courses/credits from another postsecondary institution; otherwise, column B should be left completely blank. It is anticiated that transfer information will be present on roughly 30 percent of the transcripts.

Transfer data is recorded on the student's transcript in different ways by different institutions. Some institutions provide a complete list of all transferred courses, by term, with corresponding grades and credit hours; however, most institutions only list the transferred courses and their associated credit hours. In any case, the procedures to be followed in completing column B of the table are the same as those described above for column A, with one major exception: if no grades are provided for the transferred coures, only the first line in column B need be completed. In this case, simply enter the total number of credit hours associated with transferred courses in the content area in the space corresponding to "Passed" and leave the other spaces in column B blank.

NOTE: Transferred credit hours (Column B entries) must be coded in the same credit type used by the last school attended (Column A). If the credit system used by the previous (transfer) school is different from that used by the transcript school, you must recompute the transferred credits--unless they have already been converted--using the following conversion rule:

Quarter Hours = Semester Hours x 1.5
or
Semester Hours = Quarter Hours x .67

II. CONTENT AREA CODE LIST

Education and Related Fields (Code=1)

Education, General
Pre-Elementary Education
Kindergarten Education
Elementary Education, General
Secondary Education, General
Junior High School Education
Higher Education, General
Junior College Education
Community College Education
Continuing Education
Adult Education
Special Education, General
Education of Mentally Retarded
Education of the Gifted
Education of the Culturally Disadvantaged
Speech Correction
Education of the Emotionally Disturbed
Remedial Education
Special Learning Disabilities
Education of the Physically Handicapped

Social Foundations of Education
Philosophy of Education
History of Education
Educational Psychology
Educational Statistics
Educational Research
Educational Testing
Educational Measurement
Educational Evaluation
Educational Counseling
Educational Guidance
Educational Administration
Educational Supervision
Curriculum
Instruction

Reading Education
Art Education
Music Education
Mathematics, Education
Science Education
Physical Education
Safety Education
Driver Education
Health Education
Family Life Education
Distributive Education
Commerce Education
Business Education
Industrial Arts Education
Technical Education
Vocational Education
Education, Other (e.g., Bilingual Teacher)

Home Economics, General
Textiles, Home Economics
Home Management
Family Relations
Dietetics
Foods and Nutrition

Humanities (Code=2)

Foreign Languages, All
Teaching of English as a Foreign Language
Sanskrit
English, General
English, Literature
Literature, Comparative
Classics

Reading
Linguistics
Semantics
Philology
Phonetics
Rhetoric
Public Address
Speech
Debate

Creative Writing

Philosophy

Theological Profession, General
Biblical Languages
Education, Religious
Religious Studies

History

Black Culture Studies
Afro American Studies
African Studies
American Indian Cultural Studies
Mexican-American Cultural Studies
Asian Studies
India Studies
Islamic Studies
Slavic Studies
Russian Studies
Latin American Studies
Middle Eastern Studies
European Studies, General
American Studies
Pacific Area Studies

Other Nonscientific Academic Fields (Code=3)

Agriculture, General
Agronomy
Crop Management
Field Crops
Soil Management
Soil Conservation
Husbandry, Animal
Wildlife Management
Fish Management
Game Management
Fruit Production
Horticulture
Vegetable Production
Ornamental Horticulture
Floriculture
Farm Management
Agricultural Management
Agricultural Economics
Agricultural Business
Food Technology
Forestry
Natural Resources Management
Forestry Technology
Agriculture Technologies
Range Management

Business Management
Business Administration
Operations Research
Restaurant Management
Hotel Management
Institutional Management
Cafeteria Management
Marketing
Purchasing
Public Utilities
Transportation
Insurance
International Business
Secretarial Studies
Personnel Management
Industrial Relations
Labor Relations

Economics, Business
Consumer Economics
Communication, General
Journalism
Radio
Television
Advertising
Communication Media

Business, General
Commerce, General
Accounting
Business Statistics
Banking
Finance
Investments
Securities

Law, General

Community Services, General
Public Administration
Park Management
Recreation Management
Social Work
Clinical Social Work
Helping Services
Law Enforcement
Corrections
Rehabilitation Services
International Public Service
Public Affairs and Services,
  Other (e.g., Fire Science)

Library Science, General

Fine Arts, General
Sculpture
Painting
Art
Commercial Art
Drawing
Art History
Art Appreciation
Music, Theory
Music, Performing
Music Composition
Music (Liberal Arts Program)
Music History
Music Appreciation
Musicology
Dramatic Arts
Dance

Ceramics
Weaving
Photography

Social Sciences (Code=4)

Social Sciences, General

Psychology, General
Experimental Psychology (Animal)
Clinical Psychology
Counseling, Psychology
Social Psychology
Psychometrics
Statistics in Psychology
Industrial Psychology
Developmental Psychology
Physiological Psychology
Learning Theory
Child Development

Anthropology
Archeology
Economics
Geography
Government
Political Science
Sociology
Criminology
International Relations
Urban Studies
Demography

Natural Science, Engineering, and Related Scientific Fields (Code=5)

Mathematics, General
Mathematics, Applied
Statistics, Mathematical and Theoretical

Military Science
Naval Science
Aerospace Science

Physical Sciences, General
Physics, General
Molecular Physics
Nuclear Physics
Chemistry, General
Inorganic Chemistry
Organic Chemistry
Physical Chemistry
Analytical Chemistry
Pharmaceutical Chemistry
Astronomy
Astrophysics
Atmospheric Sciences
Meterology
Geology
Geochemistry
Geophysics
Seismology
Earth Sciences, General
Paleontology
Oceanography
Metallurgy

Biology, General
Botany, General
Bacteriology
Plant Pathology
Plant Pharmacology
Plant Physiology
Zoology, General
Pathology, Human
Pathology, Animal
Pharmacology
Physiology, Human
Physiology, Animal
Microbiology
Anatomy
Histology
Biochemistry
Biophysics
Molecular Biology
Cell Physiology
Cell Biology
Cytology
Marine Biology
Biostatistics
Biometrics
Ecology
Entomology
Genetics
Radiobiology
Nutrition, Scientific
Neurosciences
Toxicology
Embryology
Limnology
Icthtyology
Parasitology
Ornithology

Health Professions, General
Health Care Administration
Hospital Administration
Nursing
Dentistry
Dental Specialties
Medicine
Medical Specialties
Occupational Therapy
Optometry
Osteopathic Medicine
Pharmacy
Physical Therapy
Dental Hygiene
Public Health
Medical Record Librarianship
Podiatry
Biomedical Communication
Veterinary Medicine
Speech Pathology
Audiology
Chiropractic
Medical Laboratory Technologies
Dental Technologies
Radiologic Technologies

Natural Science, Engineering, and Related Scientific Fields (Code=5) [continued]

Environmental Design, General
Architecture
Interior Design
Landscape Architecture
Urban Architecture
Naval Architecture
Regional Planning
City Planning
Community Planning

Engineering, General
Astronautical Engineering
Aerospace Engineering
Aeronautical Engineering
Agricultural Engineering
Architectural Engineering
Biomedical Engineering
Bioengineering
Chemical Engineering
Petroleum Refining
Petroleum Engineering
Transportation Engineering
Civil Engineering
Construction Engineering
Communication Engineering
Electrical Engineering
Electronics Engineering
Mechanical Engineering
Geological Engineering
Geophysical Engineering
Management, Engineering
Industrial Engineering
Metallurgical Engineering
Materials Engineering
Ceramic Engineering
Textile Engineering
Mining Engineering
Mineral Engineering
Engineering Physics
Nuclear Engineering
Engineering Mechanics
Environmental Engineering
Marine Engineering
Ocean Engineering
Engineering Technologies
Sanitary Engineering

Computer Sciences, General
Information Sciences, General
Information Systems
Data Processing
Computer Programming
System Analysis

Trade and Related Nonacademic Fields (Code=6)

Agricultural Mechanics
Agricultural Production
Gardening
Pet Grooming
Modeling (Apparel and Accessories)
Floral Design
Floristry
Food Distribution
Food Services
Cooking
Realty
Recreation and Tourism
Design (Clothing)
Tailoring
Fashion Design
Air Conditioning Installation and Repair
Appliance Repair
Television Repair
Radio Repair
Auto Repair
Auto Mechanics
Automotive Service, Other
Aircraft Mechanics
Aircraft Maintenance
Blueprint Reading
Business Machine Maintenance
Carpentry

Cabinetmaking
Electricity, Construction
Heavy Equipment Mechanics
Heavy Equipment Maintenance
Masonry
Bricklaying
Concrete Finishing
Paperhanging
Painting and Decorating
Plastering
Plumbing and Pipefitting
Sheetrock Installation
Drywall Installation
Glazing
Roofing
Construction and Maintenance, Other
Diesel Mechanics
Drafting
Cartographics
Electric Motor Repair
Small Engine Repair
Communication Assembly Repair, Installation, Etc.

Industrial Electronics
Fabric Maintenance
Piano Tuning
Instrument Maintenance and Repair
Machine Tool Operations
Welding and Cutting
Tool and Die Making
Smelting
Metalworking, All Other
Metalsmithing
Barbering
Cosmetology
Hair Styling
Molding
Bartending
Meat Cutting
Knitting
Spinning
Textile Fabrication
Textile Design
Leatherworking
Upholstering
Woodworking
Trade and Industrial Occupations, Other
Jewelry
Cinematography
Interior Decoration

III. TRANSCRIPT CODING FORM

Transcript Coding Form

1. Student ID Number ______________________________
2. Major Field ____________________________________
3. Academic Probation ____________________________
4. Academic Dismissal ____________________________
5. Credit Type ___________________________________
6. Course of Study Completion ____________________
7. Certificates, licenses, diplomas, or degrees earned:

(Circle all that apply.)

Cannot determine	1
Certificate	2
License	3
1-year, 2-year, or 3-year vocational degree or diploma	4
2-year academic degree	5
4-year or 5-year college Bachelor's degree	6

8. Number of Content Areas Coded ____________

Student ID # ☐

9. Academic Attendance History:

	INFORMATION OBTAINED DIRECTLY FROM TRANSCRIPT					INFORMATION INFERRED				
	Not In School	High School	Voc-Tech School	2-Year College	4-Year College	Not In School	High School	Voc-Tech School	2-Year College	4-Year College
a. Summer 1973	1	2	3	4	5	6	7	8	9	10
b. Fall 1973	1	2	3	4	5	6	7	8	9	10
c. Winter 1973-74	1	2	3	4	5	6	7	8	9	10
d. Spring 1974	1	2	3	4	5	6	7	8	9	10
e. Summer 1974	1	2	3	4	5	6	7	8	9	10
f. Fall 1974	1	2	3	4	5	6	7	8	9	10
g. Winter 1974-75	1	2	3	4	5	6	7	8	9	10
h. Spring 1975	1	2	3	4	5	6	7	8	9	10
i. Summer 1975	1	2	3	4	5	6	7	8	9	10
j. Fall 1975	1	2	3	4	5	6	7	8	9	10
k. Winter 1975-76	1	2	3	4	5	6	7	8	9	10
l. Spring 1976	1	2	3	4	5	6	7	8	9	10
m. Summer 1976	1	2	3	4	5	6	7	8	9	10
n. Fall 1976	1	2	3	4	5	6	7	8	9	10
o. Winter 1976-77	1	2	3	4	5	6	7	8	9	10
p. Spring 1977	1	2	3	4	5	6	7	8	9	10
q. Summer 1977	1	2	3	4	5	6	7	8	9	10
r. Fall 1977	1	2	3	4	5	6	7	8	9	10
s. Winter 1977-78	1	2	3	4	5	6	7	8	9	10
t. Spring 1978	1	2	3	4	5	6	7	8	9	10
u. Summer 1978	1	2	3	4	5	6	7	8	9	10
v. Fall 1978	1	2	3	4	5	6	7	8	9	10

Student ID # ☐

Content Area Data Sheet

10. Content Area Code ______

Grade or Situation	Standard Code	A. Number of Credit Hours At Last School Attended	B. Number of Credit Hours Transferred
Passed*	30	______	______
A+	22	______	______
A	20	______	______
A-	18	______	______
B+	17	______	______
B	15	______	______
B-	13	______	______
C+	12	______	______
C	10	______	______
C-	8	______	______
D+	7	______	______
D	5	______	______
D-	3	______	______
F or U	0	______	______
No Grade or Credits Reported	40	______	______

*Includes transfers with no grade given and grades of "S" and "P".

Appendix G

Sample Weight Adjustments

Appendix G

Sample Weight Adjustments

I. OVERVIEW

Three conceptually different weight adjustment procedures are discussed in this appendix, all of which were employed to provide more meaningful analyses. The first procedure discussed below is a technique whereby two artificial groups were constructed such that the comparison group would be similar to the UB participant group on relevant student background variables (sex, race, poverty status, and academic risk status, on initial grade cohort distribution, and in total group size. In essence, the procedure forces a greater similarity between the two groups in terms of characteristics that are theoretically related to outcomes but that were not completely controlled by the study design. This adjustment procedure (a form of partial balancing) was used exclusively for the relational analyses reported in Chapter 4.[1]

The second procedure discussed in this appendix involves the adjustment of sample weights for the subsampling procedures used, for instrument nonresponse, and for item indeterminacy. The need for weight adjustment due to subsampling is rather intuitive and obvious. The adjustment for nonresponse or item indeterminacy was used to correct results for possible bias introduced by the failure to contact some individuals or for the provision of incomplete data by some individuals. Such adjustments involved an apportioning of sampling weights of nonrespondents among the respondents who were most like them. These adjustment procedures were used only for the hypothesis-testing analyses reported in Chapter 3.[2]

The final procedure considered involves the adjustment of sampling weights for those individuals originally selected into the comparison group who subsequently reported participation in the UB program (crossovers). The procedure was used to adjust for the fact that crossovers, by virtue of their representing a much larger population and being selected at considerably lower sampling rates, carried considerably greater sampling weights than those originally sampled as UB participants. The adjustment involved a form of weight smoothing that reduced the discrepancies in the weights between the originally sampled UB participants and the crossovers, while maintaining the distributional properties of the originally sampled UB participants. These adjustment procedures also were used exclusively for the hypothesis-testing analysis reported in Chapter 3.[3]

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[1] Although the variables considered in this adjustment (excepting group size) were also included as predictors in the structural equations, the procedure was implemented to reduce certain technical problems introduced through markedly different sampling weight sums (reflecting similar differences in the populations represented by the two groups) and differential distributions within the groups on the variables of interest.

[2] For the exploratory relational analyses, assumptions of randomness of nonresponse were made, and differential sampling and subsampling probabilities were not considered.

[3] Assumptions made in weight constructions for the exploratory relational analyses did not consider original sampling weights; therefore, the smoothing procedure was not required.

Discussion of the actual procedures used is provided in subsequent sections of this appendix. The remainder of this introductory section will present certain considerations basic to the use of the techniques.

A. Considerations of Corrections for Group Differences

In cases such as the current one, where moderating variables (individual background variables and initial grade cohort) are related to criterion variables (educational outcomes) and where the moderating variables are differentially distributed within the groups under consideration (former participants and nonparticipants), it is usually sound analytic practice to adjust or correct the criterion variables for the influence of the moderating variables. There are many techniques available to accomplish this adjustment process. Perhaps the most widely used is linear regression, in which the linear relation of moderating variable to criterion variable is removed (e.g., analysis of covariance, partial correlation techniques). A very simple form of this technique is well adapted to quantitative data when one is willing to assume that the majority of the moderator's influence is linear and equivalent for different subgroups.

Another approach to data adjustment is the analysis of variance model. This technique, considered within the framework of general linear models, may be used to examine the "effects" (both main effects and interaction effects) of specific categorical factors after having removed any effect attributed to other categorical factors. Like the linear regression model, relatively strong assumptions about the data must be made (e.g., equality of variances over subgroups), and this technique is best applied to quantitative criterion variable data. It would be difficult to employ a complete analysis of variance model, since the number of cases in some cells of the model would be extremely small. Further, since much of the criterion variable data was stated in proportions, considerable data transformation (i.e., log or arc sine transformations) might be required, and reporting such transformed data often clouds interpretation.

For the specific purpose of the adjustment procedure needed for the relational analyses, neither of these approaches were considered appropriate. Instead, adjustments were based on procedures that are similar to those used by demographers in constructing "adjusted," "standardized," or "corrected" birth and death rates.[4]

B. Considerations of Adjustments for Instrument and Item Nonresponse

For the complex sample design used in the UB evaluation, individuals were selected into the sample with unequal probabilities. Therefore, to inflate the sample to the size of the population being estimated (so that each person represented the correct number of persons in the population), sample weights that were inversely proportional to the probability of selection were applied to individual responses. (See Appendix A for a discussion of the use of sample weights.) In producing these national estimates, some type of adjustment was needed to correct for the failure of individuals to return questionnaires or to return fully completed questionnaires.

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[4] See Spiegelman, M. Introduction to Demography. Cambridge, Massachusetts: Harvard University Press, 1968.

The two most common techniques for handling indeterminate data are imputation techniques and weight adjustment techniques. There are many specific imputation techniques available, but all of them involve creating data for those individuals who have not responded to a particular item. Some techniques assign the mean value of similar individuals; others assign the values of the one individual most like the nonrespondent; still others involve simple or iterative regression models to predict (according to specified criteria) what the missing data most likely would be. Similarly, there are various available weight adjustment procedures; however, they all involve assignment of the weights of nonrespondents to those who responded to a particular instrument or item.

In general, the method of weight adjustment used in this study involved the proportional distribution of a nonrespondent's sampling weight to that group of responding individuals judged to be most similar to him/her. In terms of estimates of means and proportions obtained, this technique yields results that are equivalent to assigning the nonrespondent an imputed value of the group mean of similar respondents. In terms of standard error computation, the two techniques do not yield equivalent results; larger standard errors are obtained by the weight adjustment method. RTI chose the more conservative weight adjustment procedure.

C. Considerations of Weight Smoothing for Crossovers

During the first follow-up evaluation, a number of cases with conflicting UB participation classification were discovered. Some individuals who were originally selected into the UB participant group indicated that they had never participated in UB, and some individuals who were originally selected into the comparison nonparticipant group reported UB membership (in some cases prior to the original sampling). The first group (previously classified as UB participants) consisted of individuals who were either inappropriately defined in the sampling frame or who did not report their UB participation for some reason (forgot about it or did not wish to report it). Various forms of bias could have entered the results by inclusion of these cases (the type of bias suspected varies with the reason for the conflicting classifications), and these cases were excluded from analysis.

The second group (previously classified as nonparticipants) could be subdivided into two categories: the first category included those who reported first UB participation in a grade prior to their grade placement at time of sampling. If their follow-up questionnaire responses were correct, then they were probably not defined in the original sampling frame (e.g., were not active UB participants at time of sampling and were not in the comparison population due to prior UB participation). Other explanations are possible. The second category contained those who reported first UB participation in their grade at time of sampling or subsequently. If their follow-up questionnaire responses were correct, then this group likely represents those who were nonparticipants at time of sampling but who joined UB after the time at which the sample was defined. For technical reasons, it was decided to exclude these groups also from the first follow-up analyses.[5]

---

[5] These groups were not large enough to be included as a separate analysis category, and these cases represented certain sampling weight anomalies that might have distorted results had they been included with the original treatment group.

While those who were sampled as participants, but who no longer report UB participation, represent an interesting group, it was assumed on the basis of first follow-up frequencies (N = 37) that such individuals represented such a small segment of the population and such a distorted one that their exclusion from second follow-up analysis was justified. The nonparticipant-to-participant crossovers were expected to constitute a larger group (N = 193 in the first follow-up), and one that was legitimate for consideration, particularly in light of the participation pattern categories considered.[6]

Consideration of crossovers did represent technical problems, however. Since the originally defined comparison population was appreciably larger than the UB population and since selection rates from that population were appreciably smaller, the selection probabilities for comparison sample students were considerably smaller than for the corresponding Upward Bound students. Consequently, the 210 comparison students who subsequently joined the UB program had much larger sample weights (reciprocal of selection probabilities) than the original UB students. Incorporating these Comparison-to-UB crossovers directly into the treatment group estimates could have significantly reduced the stability of the resulting combined statistics.

RTI had recently experimented with several weight adjustment techniques that seemed particularly suited to the problem outlined above. This class of adjustment algorithms can be characterized as weight smoothing techniques that reapportion the total sampling weight sum between the "large" and "not-large" weight groups so as to control the resulting bias in combination statistics while attempting to minimize the inflationary effect of unequal weighting. The particular algorithm chosen for this study was relatively simple and could be implemented more efficiently than some of the more complex, more expensive, and only marginally more effective algorithms.

II. SPECIFIC PROCEDURES USED IN PARTIAL BALANCING

The procedures used in partial balancing involved an attempt at standardizing the characteristics of the comparison group of nonparticipants to the UB population characteristics over of the three initial grade cohorts 10-12.[7] Three separate partial balancings were implemented; one for the total group, one for the PSE-entering subgroup, and one for the subset of the PSE-entering group with available data for the structural equation solution reported in Chapter 5.[8] To better understand the balancing approach used in the current study, particularly its partial nature, the full balancing procedure that was used in previous studies will be described first. The full procedure is described for balancing within grade cohort; however, an extension to balancing over grade cohort is quite straightforward.

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[6] Crossovers could define particular participation patterns that were theoretically impossible for those originally selected as participants (see Appendixes E and H).

[7] It should be noted that the balancing procedure used in this study (as well as that used in previous studies) only attempted adjustment for two groups--former participants and nonparticipants. Adjustment within the former participant group on the basis of participation pattern was not attempted.

[8] The two former balancing procedures were carried out in anticipation of a set of analyses that was not completely implemented.

A. The Full Balancing Procedure Within Grade Cohort[9]

The procedure used in previous studies involved balancing of the former participant and nonparticipant populations to be basically equivalent in respect to characteristics. This was accomplished by defining balancing groups of individuals with similar characteristics and by then adjusting the two groups (former participants and nonparticipants), so that the adjusted weighted proportional representation of the characteristics within each group was the same.[10]

For each of grades 10, 11, and 12, 16 balancing groups were formed both for UB participants and for the comparison group. The 16 balancing groups were based on two variables associated with UB participation qualifications, namely poverty status and academic risk, and on two additional variables, ethnicity and sex. The 16 balancing groups were formed as a partial crossing of these four variables as indicated in Table G.1.[11]

Within each of the three grades separately and for each of the 16 balancing categories, the total estimated relative population size was obtained for UB students and for comparison students. Using these numbers, a balancing weight component was computed for each category. Each comparison student's final sample weight was then multiplied by each balancing weight component appropriate to his categorization to obtain his two final balanced weights. Balanced or standardized rates, proportions, etc. could then be estimated for the comparison students by using the appropriate final balanced weights rather than the original sample weights. Comparing UB participant statistics with balanced comparison statistics would then be free of the effects of differential distributions among the balancing groups.

Only the within-grade balancing procedure is considered, since it is somewhat simpler to describe than the over-grade balancing, and since the latter balancing is completely analogous. The computations for within-grade balancing are given below:

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[9] In general, subscripts and superscripts are used consistently in this subsection as follows:

j, indicates an individual;
$k \leftarrow 1, 2, \ldots, 16$, indicates a balancing category;
$g \leftarrow 10, 11, 12$, indicates initial grade cohort;
u, indicates former Upward Bound participant;
c, indicates nonparticipant; and
' is used to indicate a balanced value.

[10] Original sampling weights were not used in the partial balancing implemented in the current study, thus, the balancing was restricted to the sample (or subsets of it), rather than to the population.

[11] This is effectively a balancing on the joint distribution of the variables considered. Such a balancing approach accounts for any interrelatedness of the variables used and thus ensures that the groups are also balanced on the marginal distributions of the variables.

Table G.1

DESCRIPTION OF THE SIXTEEN CATEGORIES USED IN BALANCING WITHIN GRADE

Ethnicity and Sex	Poverty Status and Academic Risk			
	Poverty Risk	Poverty "Not Risk"	"Not Poverty" Risk	"Not Poverty" "Not Risk"
Black, male	1	2	3	4
Black, "not male"	5	6	7	8
White, all sexes	9	10	11	12
Other, all sexes	13	14	15	16

NOTE: Table entries indicate the 16 balancing group numbers as a function of the marginal classifiers. The categories "not male," "not risk," and "not poverty," include cases which could not be classified due to indeterminate data as well as cases that could be classified as female, not risk, and not poverty, respectively.

For a given grade g, g ← 10, 11, 12, define the estimated number of UB students in grade g and in balancing category k, k ← 1, 2, ..., 16, as $Y_{ug}(k)$, which was determined as follows:

$$Y_{ug}(k) = \sum_{j=1}^{N} W_j \, U_j \, G_j \, K_j \, E_j \; ;$$

where

N is the total number of individuals (N=6050),

W_j is the eligible-adjusted weight for individual j,

U_j is a UB status indicator, with value 1 if individual j indicated UB participation and 0 otherwise,

G_j is a grade status indicator, with value 1 if initial grade cohort of individual j was g and 0 otherwise,

K_j is a group status indicator, with value 1 if the balancing group of individual j was k and 0 otherwise,

E_j is an eligibility indicator, with value 1 if individual j was eligible for the survey and 0 otherwise.

Also define, for grade g, the estimated number of nonparticipants in grade g and balancing category k as $Y_{cg}(k)$, which was determined as follows:

$$Y_{cg}(k) = \sum_{j=1}^{N} W_j \; C_j \; G_j \; K_j \; E_j \;,$$

where C_j is $1-U_j$ and where N, W_j, G_j, K_j, and E_j are defined above.

Now $\pi_{ug}(k)$, the proportion of the grade g UB population in balancing class k, is defined as

$$\pi_{ug}(k) = \frac{Y_{ug}(k)}{\sum_{k=1}^{16} Y_{ug}(k)} \;.$$

An analogous proportion, $\pi_{cg}(k)$ was also determined for the comparison group as

$$\pi_{cg}(k) = \frac{Y_{cg}(k)}{\sum_{k=1}^{16} Y_{cg}(k)} \;.$$

Define the balancing weight correction component for category k as $\omega_g(k)$, where

$$\omega_g(k) = \frac{\pi_{ug}(k)}{\pi_{cg}(k)} \;.$$

The within-grade balanced weight for an individual, $\beta_g(j)$, was then determined within grade g and balancing category k as follows:[12]

$$\beta_g(j) = \begin{cases} W_j \; E_j, \text{ if } C_j = 0, \\ W_j \; E_j \; \omega_g(k), \text{ if } C_j = 1. \end{cases}$$

B. Partial Balancing Procedures

Since balancing category group sizes were restricted in the current study, due to the fact that more variables and partitionings were used, the full balancing approach could not be implemented (i.e., the number of cases within a particular balancing category and grade was in some cases reduced either to zero or to a size insufficient to provide stable estimates of the balancing weight correction component). Thus, a partial balancing was implemented. In general, the partial balancing approach differs from full balancing in that the full joint distribution of the balancing variables is not considered. Rather, the procedure involves only a consideration of either the marginal distribution of the separate balancing variables or marginal joint distributions of subsets of the variables. Thus, more than one set of proportions and more than one weight correction component is considered.

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[12] Note that the weight of UB participants (C_j=0) is not affected by the balancing. The use of the value E_j in this process is somewhat redundant, since it only serves to set the weight of ineligibles to 0. This had already been accomplished at the time balancing operations were implemented, with any appropriate adjustments (see Section VI of this appendix).

As such, each individual is categorized two or more times, such that categorizations are mutually exclusive and exhaustive (i.e., each categorization is defined by a different unique subset of the total set of balancing variables). Subsequently, adjustments were made by considering simultaneously the adjustments necessary for balancing within each of the separate categorizations. Unlike the full balancing procedure, the partial procedure does not guarantee equivalence of the marginal proportions, unless the separate categorizations are independent. The specific computational procedure within a particular grade is given below; considering the original sampling weight W_j.[13]

For each of M categorizations, define $Y^m_{ug}(k_m)$ and $Y^m_{cg}(k_m)$ as before, where $k_m \leftarrow 1, 2, \ldots, K_m$, and K_m is the number of distinct categories within the m^{th} categorization. Similarly, the proportion of UB participations in grade g and in balancing category k_m of categorization m is given by

$$\pi^m_{ug}(k_m) = \frac{Y^m_{ug}(k_m)}{\sum\limits_{k_m=1}^{K_m} Y^m_{ug}(k_m)} .$$

The corresponding proportion for nonparticipants, $\pi^m_{cg}(k_m)$, is given by an analogous equation in terms of $Y^m_{cg}(k_m)$.

The balancing weight correction component for category k_m, $\omega^m_g(k_m)$ is defined as

$$\omega_g{}^m(k_m) = \frac{\pi^m_{ug}(k_m)}{\pi^m_{cg}(k_m)} .$$

Such correction factors are computed for all K_m categories within each of the M categorizations considered.

The within-grade, partially balanced weight, $\beta_g'(j)$, for an individual who is classified in categories $k_1, k_2, \ldots, k_M$ may be determined as follows.

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[13] While within grade balancing was never implemented in the current study and original sampling weights were not used, the computational equations are presented in terms of these factors for comparability with the full balancing procedure equations.

$$\beta_g'(j) = \begin{cases} W_j\ E_j,\ \text{if } C_j = 0, \\ W_j\ E_j \prod_{m=1}^{M} \omega_g^m(k_m),\ \text{if } C_j = 1. \end{cases}$$

It can be observed from this expression and the previous discussion that if the M categorizations are independent, then the full and partial balancing approaches should lead to identical results, since the product of the corrections for the separate categorizations is the expected correction for the full joint categorization in the case of independence. That is, given independence,

$$\begin{aligned} \prod_{m=1}^{M} \omega_g^m(k_m) &= \frac{\pi_{ug}^1(k_1)}{\pi_{cg}^1(k_1)} \cdot \frac{\pi_{ug}^2(k_2)}{\pi_{cg}^2(k_2)} \cdots \frac{\pi_{ug}^M(k_M)}{\pi_{cg}^M(k_M)} . \\ &= \frac{\pi_{ug}(k)}{\pi_{cg}(k)} , \\ &= \omega_g(k). \end{aligned}$$

Under the more likely case of nonindependence, results of the two approaches are different and the partial approach does not guarantee equality of marginal proportions for the variables considered, or for any marginal joint distribution. Better solutions could probably be obtained through an iterative approach to partial balancing, but such an approach was not considered in this study.

C. Specific Modifications of the Partial Balancing Procedures

The major purpose of the balancing procedure used in the current study was to produce artificial groups of participants and nonparticipants that were: (1) similar in terms of the characteristics of grade cohort; poverty status; risk status; sex; race; and, in some cases, over-age-in-grade status, and (2) similar in size. To accomplish this in a way that could be accomodated by available software within the exploratory focus of the analyses involved, it was decided jointly by RTI and OED to examine the sample-specific data, without concern for sampling probabilities. While this precluded generalizability of related analytic results beyond the sample, it was a convenient approach within the accepted analytic focus, and it reduced problems with available software (see Appendix I).

Within the adopted approach, weights for both former participants and nonparticipants were set to unity. Then, within each of three distinct sets of sample members, a modified partial balancing approach was implemented. First correction factors were calculated, analogously to the procedure described in the previous subsection but using the unit weights. Next, a correction for differences in group sizes, ζ, was computed as

$$\zeta = \frac{\sum_{j=1}^{N} W_j\ U_j}{\sum_{j=1}^{N} W_j\ C_j} ,$$

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which, for the unit weights used, reduces to the ratio of the size of the former participant subgroup to the size of the nonparticipant subgroup. Finally, the adjusted weights, $\beta_{.}''(j)$, were computed as

$$\beta_{.}''(j) = \zeta \, \beta_{.}'(j),$$

where $\beta_{.}'(j)$ is $\beta_{g}'(j)$ further adjusted for grade cohort differences.

As stated previously, three partial balancing adjustments were performed. For the total group (excluding cases that could not be classified due to missing values on the classification variables) the partial balancing was accomplished for two categorizations representing marginal joint distributions; one based on a crossing of poverty status, risk status, and race; the other based on a crossing of sex, grade cohort, and age within grade. Parameters for this partial balancing are given in Table G.2. A second partial balancing was performed for the PSE-entering subgroup, using the same two categorizations; parameters for this procedure are given in Table G.3.

The final partial balancing was accomplished for the subset of the PSE-entering subgroup for whom complete data was available for the path analyses. Five categorizations--representing the variables academic risk status, poverty status, sex, race, and grade cohort--were used for this adjustment.[14] The parameters for this adjustment are given in Table G.4.[15]

As suggested in Tables G.2 and G.3, the individual adjustment variables are not independent, and as a result, the marginal group proportions after adjustment were not identical. These marginal proportions were examined for the final partial balancing described above; this examination indicated that the procedure overadjusted the nonparticipant group for poverty status, race, and size. On other factors, however, the procedure produced comparable marginal frequencies for the variables considered (see Table I.1 of Appendix I).

D. Standard Errors for Balanced Weights

As would be expected, balancing introduces additional problems for standard error computation. For the full balancing procedure used in previous studies, equations were developed and software prepared to compute appropriate standard errors.[16] For the purely exploratory nature of the current application of partial balancing, it was not considered cost-effective to develop the solutions, since available software for the analytic technique using these adjusted weights (structural equation approach) does not handle these points

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[14] The subsetting had reduced the original group to about one-third of its previous size, and even marginal joint classifications produced insufficient cell sizes for the procedure.

[15] In actuality, all resulting weights were multipled by a constant (13) to keep all adjusted weights equal to or greater than unity.

[16] See Appendix E of Burkheimer, G. J., French, A. M., Levinsohn, J. R., and Riccobono, J. A. Evaluation Study of the Upward Bound Program: A First Follow-up. (RTI final report for Project 22U-889). Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, September 1977.

Table G.2

GROUP PROPORTIONS AND ADJUSTMENT FACTORS FOR THE TWO CATEGORIZATIONS USED IN PARTIAL BALANCING FOR TOTAL GROUP

First Categorization						Second Categorization					
Categories						Categories					
Poverty Status	Academic Risk Status	Race	Proportion of Participants	Proportion of Non-Participants	Adjustment Factor	Sex	Grade Cohort	Age-Within-Grade Status	Proportion of Participants	Proportion of Non-Participants	Adjustment Factor
Poor	Risk	Black	.216	.130	1.663	Male	10	Not Over	.053	.148	0.356
Poor	Risk	White	.040	.069	0.584	Male	10	Over	.011	.025	0.443
Poor	Risk	Other	.053	.047	1.121	Male	11	Not Over	.140	.142	0.980
Poor	Not Risk	Black	.271	.095	2.858	Male	11	Over	.027	.030	0.886
Poor	Not Risk	White	.086	.080	1.070	Male	12	Not Over	.171	.145	1.171
Poor	Not Risk	Other	.070	.036	1.955	Male	12	Over	.029	.021	1.385
Not Poor	Risk	Black	.069	.054	1.268	Female	10	Not Over	.067	.116	0.574
Not Poor	Risk	White	.020	.136	0.148	Female	10	Over	.008	.020	0.378
Not Poor	Risk	Other	.021	.035	0.590	Female	11	Not Over	.205	.140	1.466
Not Poor	Not Risk	Black	.093	.054	1.728	Female	11	Over	.016	.014	1.148
Not Poor	Not Risk	White	.039	.233	0.169	Female	12	Not Over	.253	.187	1.357
Not Poor	Not Risk	Other	.023	.031	0.727	Female	12	Over	.021	.010	2.044

NOTE: These values were determined using unit weights for the 1,257 nonparticipants and 2,129 former participants with determinate values of the classifying variables; therefore, cell sizes can be determined from the proportions given. The group size correction factor is seen to be 2,129/1,257 = 1.694.

Table G.3

GROUP PROPORTIONS AND ADJUSTMENT FACTORS FOR THE TWO CATEGORIZATIONS USED IN PARTIAL BALANCING FOR PSE-ENTERING SUBGROUP

First Categorization						Second Categorization					
Categories						Categories					
Poverty Status	Academic Risk Status	Race	Proportion of Participants	Proportion of Non-Participants	Adjustment Factor	Sex	Grade Cohort	Age-Within-Grade Status	Proportion of Participants	Proportion of Non-Participants	Adjustment Factor
Poor	Risk	Black	.219	.121	1.813	Male	10	Not Over	.044	.146	0.300
Poor	Risk	White	.030	.045	0.679	Male	10	Over	.005	.012	0.444
Poor	Risk	Other	.043	.028	1.542	Male	11	Not Over	.141	.133	1.059
Poor	Not Risk	Black	.294	.113	2.595	Male	11	Over	.024	.017	1.399
Poor	Not Risk	White	.075	.067	1.122	Male	12	Not Over	.177	.153	1.159
Poor	Not Risk	Other	.077	.030	2.546	Male	12	Over	.027	.017	1.604
Not Poor	Risk	Black	.068	.059	1.154	Female	10	Not Over	.064	.113	0.567
Not Poor	Risk	White	.012	.104	0.112	Female	10	Over	.005	.012	0.444
Not Poor	Risk	Other	.018	.024	0.764	Female	11	Not Over	.203	.166	1.225
Not Poor	Not Risk	Black	.103	.067	1.540	Female	11	Over	.012	.012	1.035
Not Poor	Not Risk	White	.036	.308	0.118	Female	12	Not Over	.274	.213	1.287
Not Poor	Not Risk	Other	.024	.034	0.700	Female	12	Over	.023	.006	3.461

NOTE: These values were determined using unit weights for the 760 nonparticipants and 1,713 former participants with determinate values of the classifying variables; therefore, cell sizes can be determined from the proportions given. The group size correction factor is seen to be 1,713/760 = 2.254

Table G.4

GROUP PROPORTIONS AND ADJUSTMENT FACTORS FOR THE TWO CATEGORIZATIONS USED IN PARTIAL BALANCING FOR PSE-ENTERING SUBSET WITH FULL DATA FOR PATH ANALYSIS

Categorization	Category	Proportion of Former Participants	Proportion of Nonparticipants	Adjustment Factor
Race	Black	.677	.301	2.253
	White	.151	.593	0.254
	Other	.172	.106	1.620
Academic Risk Status	Not Risk	.640	.686	0.933
	Risk	.360	.314	1.147
Grade Cohort	10	.112	.303	0.371
	11	.401	.327	1.227
	12	.487	.370	1.316
Poverty Status	Not Poor	.274	.665	0.412
	Poor	.726	.335	2.167
Sex	Male	.435	.497	0.875
	Female	.565	.503	1.124

NOTE: These values were determined using unit weights for the 376 nonparticipants and 917 former participants with determinate values of the classifying variables; therefore, cell sizes can be determined from the proportion given. The group size correction is seen to be 917/376 = 2.439.

of weight adjustment. Therefore, no corrections for partial balancing were considered in the analytic applications of these adjusted weights. Consequently, the results are suspect even under the adopted exploratory analysis focus.

III. WEIGHT ADJUSTMENTS FOR SUBSAMPLING AND NONRESPONSE[17]

The weight adjustment techniques described in this section are those that were implemented to compensate for the fact that data were not collected for all 6,050 individuals in the original sample. The weight adjustments discussed here involve: (a) corrections for telephone subsampling and (b) corrections for indeterminate response.[18] The various weight adjustment techniques (including balancing) were applied sequentially, and the order in which they were applied was important in determining an individual's final weight. The order of weight adjustments is presented in Section V of this appendix.

Clearly, some adjustment in weights was required due to subsampling of mail nonrespondents, since the telephone responses of those selected were used to represent not only themselves but also those mail nonrespondents who were not selected. Since the sampling within stratum was random, the subsampling adjustment procedure involved multiplying selected nonrespondents' weights by the inverse of the appropriate within-stratum sampling rate (see Appendix C, Table C.4), and setting the weights of nonselected nonrespondents to zero.[19]

The correction for instrument and item nonresponse (or indeterminacy) is not as immediately obvious but is equally important. It is reasonable to expect that the aggregate values of responses of individuals for whom data were not collected would have been different from the aggregate values of those for whom data were collected (i.e., nonresponse is not considered to be a random process, and, therefore, is not independent of the study variable set). For example, the following assumptions are not unreasonable. The more mobile an individual, the less likely he would be located for data collection purposes and the less likely he would be expected to have obtained higher levels of educational progress. Likewise, the less satisfied an individual is with his educational progress, the less likely he would be willing to report it.

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[17] In the following presentation, subscripts and superscripts are used consistently as follows:

j, indicates an individual
$k \leftarrow 1, 2, \ldots, 24$, indicates a weight adjustment category (class);
$h \leftarrow 1, 2, \ldots, 27$, indicates project stratum;
$i \leftarrow 1, 2$, indicates project within stratum;
$g \leftarrow 10, 11, 12$, indicates initial grade cohort;
u, indicates former Upward Bound participant (typical participation);
v, indicates former Upward Bound participant (atypical participation);
c, indicates nonparticipant;
ℓ, indicates the mail nonrespondent sampling stratum;
$W^{\cdot}(\cdot)$, indicates a weight prior to adjustment; and
$W^{\cdot\prime}(\cdot)$, indicates a weight following adjustment.

[18] An additional form of weight correction was employed involving the exclusion from analyses of individuals determined survey-ineligible, specifically setting the weights of such individuals to 0. This correction is straightforward and is not described in this section; however, it is referenced in Section V of this appendix.

[19] The expected value of the adjusted weight totals over all possible subsamples is the unadjusted weight total, but, for a particular subsample, equivalence of adjusted and unadjusted weight totals is neither guaranteed nor expected.

For cases in which nonrespondents and respondents are expected to differ, spurious results could obtain if one were simply to ignore nonrespondents or to assign their weights equally to all respondents. The procedure employed involved proportionally assigning the weights of nonrespondents to those respondents who are most like them. For the purpose of this study, the variables involved in determining the similarity of individuals include UB participation pattern (typical, atypical, or nonparticipant), grade, project sampling stratum, weight adjustment class, and UB project association.[20] The weight adjustment classes are related to risk, poverty status, ethnicity, and sex, as indicated in Table G.5.[21]

A. Specific Procedures Used in Adjusting for Subsampling

This adjustment was performed exclusively for the subset of individuals who were mail nonrespondents or undeliverables at the time of telephone sampling.[22] Since sampling rates were different among the ten nonempty strata used for the subsampling (see Appendix C, Table C.4), adjustments were made within those strata.

Within each telephone subsampling stratum, ℓ, the stratum sampling rate, R_ℓ was determined as

$$R_\ell = \frac{A_\ell}{A_\ell + B_\ell}$$

where

A_ℓ = the number of selected mail nonrespondents in stratum ℓ,

and

B_ℓ = the number of nonselected mail nonrespondents in stratum ℓ.

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[20] Nonparticipants were associated with a particular UB project through the association of their high school with the project. The unadjusted and adjusted weight totals will be identical, within rounding error, under this adjustment procedure.

[21] The unadjusted and adjusted weight totals will be identical, within rounding error, under this adjustment procedure.

[22] Certain individuals were excluded from the sampling frame and a weighting class adjustment was performed for this exclusion category prior to applying the subsampling adjustment.

Table G.5

DESCRIPTION OF THE TWENTY FOUR CLASSES USED IN WEIGHT ADJUSTMENT

Ethnicity	Sex	Poverty		"Not Poverty"	
		Risk	"Not Risk"	Risk	"Not Risk"
Black	Male	1	2	3	4
	"Not Male"	5	6	7	8
White	Male	9	10	11	12
	"Not Male"	13	14	15	16
Other	Male	17	18	19	20
	"Not Male"	21	22	23	24

NOTE: Table entries indicate the 24 weight adjustment class numbers as a function of marginal classifiers. The categories "not male", "not risk," and "not poverty" include cases which could not be classified due to indeterminate data as well as cases that could be classified as female, not risk, and not poverty, respectively.

The weight adjustment factor for stratum ℓ, ω_ℓ, was computed as

$$\omega_\ell = \frac{1}{R_\ell} \quad ,$$

and the telephone sample selection adjusted weight for individual j in stratum ℓ, $W'_{\ell j}$, was defined as

$$W'_{\ell j} = \omega_\ell W_{\ell j} S_{\ell j} \quad \text{where}$$

$W_{\ell j}$ = the unadjusted[23] weight for individual j in stratum ℓ,

and

$$S_{\ell j} = \begin{cases} 1 & \text{if individual j was a selected mail nonrespondent in stratum } \ell, \\ 0 & \text{if individual j was a nonselected mail nonrespondent in stratum } \ell. \end{cases}$$

The strata employed, number of subjects within each stratum, number sampled, and sampling rates (R_ℓ) are presented in Appendix C (Table C.4).

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[23] This was not the raw sampling weight for the individual, but reflected other weight adjustments (e.g., study eligibility) made to raw weights prior to the specific adjustment for telephone sample selection.

B. Specific Procedures Used in Adjusting for Nonresponse or Indeterminacy

In cases of nonresponse or other forms of indeterminate data, weight adjustments were made. In general, such adjustments involved apportioning the sampling weights of nonrespondents proportionally among the respondents who were in a category most like them (e.g., to those responding individuals from the same project or set of schools and of the same sex, race, academic risk status, poverty status, grade level, and UB participation group). The equations given are general and apply to any given adjustment of this type. Most adjustments were performed separately within the typical participation pattern, atypical participation pattern, and nonparticipant groups; however, some adjustments (i.e., those prior to adjustment for indeterminacy of participation pattern) were performed using only two groups, former participants and nonparticipants. For purposes of parsimony the equations provided are for the typical participation pattern group only (completely analogous equations would apply for both remaining groups or for the combined former participant group).

Define the unadjusted[24] weight totals of typical UB participant respondents and nonrespondents in grade cohort g and weighting class k of project i within stratum h as $T^r_{ugk}(hi)$ and $T^n_{ugk}(hi)$, respectively. These totals are given by

$$T^r_{ugk}(hi) = \sum_{j=1}^{n_{ugk}(hi)} R_{ugk}(hij)\, W_{ugk}(hij),$$

and

$$T^n_{ugk}(hi) = \sum_{j=1}^{n_{ugk}(hi)} [1-R_{ugk}(hij)]W_{ugk}(hij) \ ,$$

where

$W_{ugk}(hij)$ = the unadjusted weight of former typical UB participant j in project hi grade cohort g and weighting class k,

$$R_{ugk}(hij) = \begin{cases} 1 & \text{if former typical participant j in project hi grade cohort g and weighting class k was a respondent,} \\ 0 & \text{otherwise,} \end{cases}$$

and

$n_{ugk}(hi)$ = the number of typical former participants in project hi grade g and weighting class k.

The weight of typical former participant nonrespondents was apportioned to typical former participant respondents--within project hi, grade g, and weighting class k--proportional to the respondents' unadjusted weights to give the adjusted weight, $W'_{ugk}(hij)$, for individual j. The adjusted weight was therefore defined as

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[24] Unadjusted in respect to the adjustment under consideration.

$$W'_{ugk}(hij) = R_{ugk}(hij)\, W_{ugk}(hij) \left[1 + \frac{T^{n}_{ugk}(hi)}{T^{r}_{ugk}(hi)} \right] .$$

Note that the adjustment was not defined for the case in which there are nonrespondents but no respondents in project hi, grade g, and weighting class k; however, when the respondent group exists,

$$\sum_{j=1}^{n_{ugk}(hi)} W'_{ugk}(hij) = T^{r}_{ugk}(hi) + T^{n}_{ugk}(hi) = \sum_{j=1}^{n_{ugk}(hi)} W_{ugk}(hij).$$

For the case in which the procedure is undefined, it was necessary to change the definition of the group "most like" the nonrespondents. This process of redefinition was approached systematically and is set forth in the following subsection.

C. Search Procedure To Identify Similar Groups Containing Respondents

For those cases in which a particular group defined by UB participation category, grade cohort, stratum, risk group, poverty status, ethnicity, sex, and project within stratum contained nonrespondents but no respondents, a search process was initiated to locate a "similar" group containing respondents over which the nonrespondents' weights could be distributed. The first step in the search process was to determine whether or not respondents were present in the same UB participation category, grade cohort, stratum, and weighting class in the other project within the stratum.[25] If so, weights for nonrespondents were apportioned within that group in the manner described previously. If not, the search continued to see if respondents were present in the original project in the weighting class defined by the opposite sex.

This process continued until a sufficiently matching group was found or until it was determined that no respondents were present within the larger group defined by UB participation pattern, grade cohort, and stratum. Where this situation obtained, the weight total for nonrespondents was apportioned across respondents in the same major class, where major class is defined by the variables above with the exception of stratum. Only if no respondents were found in one of these groups were no weighting adjustments made and the weights of such nonrespondents lost.[26]

The ordered importance of weighting class definitions employed in this process was academic risk, poverty status, ethnicity, sex, and project. The procedure of determining similarity within this ordering is fairly straightforward and is defined below.

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[25] Recall that two projects were selected within each of 27 strata.

[26] This situation was brought about through an anomaly in the weight adjustment software, which was discovered only after analyses were performed. It had been intended to apply the similarity algorithm again once stratum had been discarded; however, this feature of the weight adjustment program failed.

Identify a particular subgroup within UB participation pattern-grade cohort-stratum class as follows:

G_{mnopqi}’

where

m designates risk status $\quad m = \begin{cases} 0 \text{ if non-risk,} \\ 1 \text{ if risk;} \end{cases}$

n designates poverty status $\quad n = \begin{cases} 0 \text{ if non-poverty,} \\ 1 \text{ if poverty;} \end{cases}$

o designates white ethnicity $\quad o = \begin{cases} 0 \text{ if non-white,} \\ 1 \text{ if white;} \end{cases}$

p designates black ethnicity $\quad p = \begin{cases} 0 \text{ if non-black,} \\ 1 \text{ if black;} \end{cases}$

q designates sex $\quad q = \begin{cases} q \text{ if male,} \\ 1 \text{ if female;} \end{cases}$

i designates project within stratum $\quad i = \begin{cases} 0 \text{ if project 1,} \\ 1 \text{ if project 2.} \end{cases}$

Let this subgroup contain nonrespondents but no respondents.

Define a complement pattern as a six digit binary number, initialized to 000000, each digit of which corresponds to a subscript in the natural order. The search for a matching group containing respondents then proceeds as follows:

1. Add 1 to the complement pattern.
2. Modify each subscript based on the value of its associated complement pattern digit:

   0 → no modification,
   1 → complement.

3. If respondents are present in the newly-identified subgroup, distribute nonrespondent weights from the original group over respondents in the new group; if not, return to Step 1.

If no respondents were found within a particular class, the procedure is repeated using an analogous weighting class definition that ignores project and stratum altogether.

As an example of this procedure, consider that a subgroup characterized by: (1) non-risk, (2) non-poverty, (3) non-white, (4) non-black, (5) female, (6) project 2, has only nonrespondents. Following the notational scheme set forth above, this subgroup is designated as:

G_{000011}.

The complement pattern initialized to 000000 is incremented by 1 to yield 000001. The application of this complement pattern to the subscripts yields

G_{000010}

as the "most similar" group. This corresponds to a change in only project membership from project 2 to project 1. If no respondents are present in this group, the complement pattern is increased by 1 to yield 000010. This complement pattern, when applied to the original subscripts yields

G_{000001}

as the "next most similar" group. The most similar group is now defined as male respondents in the original project. Assuming no respondents exist within this group, the complement pattern is increased by 1 to yield 000011, and application to the original subscripts creates a most-similar respondent group

G_{000000}

(i.e., project 1, sex male).

This process continues until a group containing respondents is found and weight adjustment performed or until the complement pattern is incremented beyond 111111 at which point an informative message appears and an analogous procedure is implemented ignoring stratum and project. The only peculiarity to this procedures occurs when o and p are both equal to 1, corresponding to a null subgroup; however, the developed procedure automatically excluded this subpattern from consideration.

IV. ADJUSTMENTS FOR NONPARTICIPANT CROSSOVERS

Weight smoothing techniques were used when adding to the former participant group those who were originally sampled as nonparticipants, but who subsequently reported UB program participation (crossovers). As stated previously, the originally defined comparison population was appreciably larger than the UB population and selection rates from that population were appreciably smaller; thus, the selection probabilities for comparison sample students were considerably smaller than for the corresponding UB sample students. Incorporating these crossovers directly into the treatment group estimates would have significantly reduced the stability of the resulting combined statistics. While the weight smoothing technique employed probably resulted in some bias in the estimators, it has the effect of enhancing estimate stability (e.g., minimum variance estimators, in which the variability due to both sampling fluctuations and bias is reduced).

The motivation for the weight adjustment strategy may be seen from a simplified model for the form of combination statistics which presumes that the relative size of the large and not-large weight groups is known. That is, if π represents the true fraction of Upward Bound participants in the target population that were originally in the comparison universe, then a weighted sample mean combining both types of UB participants would have the form

$$\bar{x}_{\pi} = \pi \, \bar{x}_L + (1-\pi)\bar{x}_{NL}$$

where $\bar{x}_L$ and $\bar{x}_{NL}$ denote sample means related to a specific outcome measure for the large weight (crossovers) and not-large weight (original UB) students respectively.

While it is recognized that in most instances one would have to estimate π, using the weighted proportion of group L members in the combined sample, the assumption of known π leads to a manageable variable approximation for $\bar{x}_{\pi}$, which should suffice for current purposes; namely,

$$\mathrm{Var}(\bar{x}_{\pi}) \doteq \pi^2 \, V_L + (1-\pi)^2 \, V_{NL} + 2\pi(1-\pi) \, C_{L,NL} \, ,$$

where V_L and V_{NL} are the sampling variances of $\bar{x}_L$ and $\bar{x}_{NL}$, respectively, $C_{L,NL}$ is the sampling covariance between $\bar{x}_L$ and $\bar{x}_{NL}$ that can be induced by cluster sampling designs, and where both the L and NL samples are drawn from within a set of primary sampling units.

The effect of large weights will be manifested by a large contribution from the leading term in the variance expression given above. When the sample size n_L associated with the large weight group is considerably smaller than its proportionate share of the combined sample, one can expect serious variance inflation unless the group L outcome measures are correspondingly less variable.

To illustrate this point, consider a simplified sample design where comparison and UB students were selected by simple random sampling from national listings. For such a simplified sampling scheme, a mean PSE outcome measure for original nonparticipants with subsequent UB exposure would have approximate variance $V_L \doteq S_L/n_L$ where S_L represents population variation in outcomes among all nonparticipant list members with later UB participation. Similarly, $V_{NL} \doteq S_{NL}/n_{NL}$ would approximate the variance for the original UB sample mean. The cluster induced covariance $C_{L,NL}$ would be eliminated within this simplified sampling model.

Assuming further that the PSE outcome variations are roughly equivalent for the two groups, namely $S_L = S_{NL} = S$, then

$$\mathrm{Var}(\bar{x}_{\pi}) \doteq [\pi^2/\theta + (1-\pi)^2 \, / \, (1-\theta)]S/n_+$$

approximates the variances of the π weighted combination of PSE outcome means, with n_+ representing the combined sample size and θ the group L fraction of the combined sample, namely $\theta = n_L/n_+$. The quantity in brackets (representing the inflationary effect of unequal weighting) exceeds one, since θ, the sample allocation to the large weight group, is considerably smaller than π, the population allocation of UB participants to group L.

In the current illustration, where the average weight for original UB students is 7.7 compared with an average of 936.0 for original CS students, the 210 comparison students with subsequent UB experience would inflate to 196,560 nationally. Thus, their responses could overwhelm responses for the 2,678 first follow-up original UB respondents with a national expansion of 20,620. These expansions lead to an estimated population fraction $\pi = .901$ for the large weight crossovers whose first follow-up sample allocation is $\theta = 200/2,878 = .0695$. The associated variance inflation factor compared to an equally weighted total sample of 2,925 UB participants is 11.69 according to the simplified formulation, or roughly a 1,000 percent increase. Compared to estimates based on the sample of 2,678 original UB participants alone, combined statistics weighting in the 210 crossovers with no adjustment would have inflated the variance by a factor of 11.5.

While the previous discussion suggests that ignoring the crossovers in the first follow-up analysis was a prudent decision in terms of estimate stability, excluding them completely may be introducing more bias than is desirable. If μ_L and μ_{NL} denote the population means corresponding to the sample estimates $\bar{x}_L$ and $\bar{x}_{NL}$, the bias in $\bar{x}_{NL}$ as an estimate of the true mean $\mu = \pi\mu_L + (1-\pi)\mu_{NL}$ is

$$\text{Bias}(\bar{x}_{NL}) = -\pi(\mu_L - \mu_{NL}) .$$

Since $\pi \doteq .9$ in this instance, most of the difference between μ_L and μ_{NL} is translated directly into bias. As an alternative to $\bar{x}_{NL}$ one may consider a general biased linear estimator

$$\bar{x}_\phi = \phi\,\bar{x}_L + (1-\phi)\bar{x}_{NL}$$

where

$$\text{Bias}(\bar{x}_\phi) = (\phi - \pi)(\mu_L - \mu_{NL}).^{27}$$

Denoting the mean difference $(\mu_L - \mu_{NL})$ in the bias expression above by δ and treating the adjusted combining fraction ϕ as an arbitrary constant, the Mean-Square-Error (MSE) or squared bias plus variance for $\bar{x}_\phi$ has the form

$$\text{MSE}(\bar{x}_\phi) = (\phi - \pi)^2\,\delta^2 + \phi^2\,V_L + (1-\phi)^2\,V_{NL} + 2\,\phi(1-\phi)\,C_{L,NL} .$$

The optimum value of ϕ which minimizes the mean square error expression above is

$$\phi_{opt} = (\delta^2\pi + V_{NL} - C_{L,NL}) \;/\; (\delta^2 + V_L + V_{NL} - 2\,C_{L,NL}) .$$

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[27] In the special case used for the first follow-up analysis, ϕ took on a value of 0.

The optimum combining fraction derived above is defined in terms of unknown population means, variances, and covariances associated with a specific outcome measure; however, ϕ may by approximated by substituting sample estimates for these parameters. The large weight group has sufficient sample size in this instance to supply reasonable mean and varaniance estimates for the crossover domain. Along with the corresonding mean, variance, and covariance estimates for the original UB students, the transfer group estimates could be used to approximate the optimal weight deflation factors $\hat{\phi}/\hat{\pi}$. The original UB students would have their weights inflated by the compensating amount $(1-\hat{\phi}/\hat{\pi})/(1-\hat{\pi})$.

It should be noted, however, that the optimal adjustment factors are specific to a particular outcome variable. Thus, the adjustment factors would have to be computed for each analysis. Alternately, one could try to establish a global adjustment that performs adequately for all PSE outcomes. Both of these approaches would have been quite costly; therefore, other approaches to weight smoothing were considered.

The procedure selected was quite simple and easily implemented. The procedure involved: (1) determining the average weight for the total group of originally selected UB participants and crossovers; (2) assigning the average weight to all crossovers; and (3) apportioning the remaining weight total uniformly over the originally sampled participants. Although it had been planned originally to perform such smoothings within projects, such a procedure resulted in certain anomalies. Since weights for originally sampled participants within a particular project were identical (see Appendix C), except for minor differences introduced through previous adjustments, smoothed weights for original participants and crossovers would also be equivalent with project. Further, since the number of crossovers varied substantially over projects, smoothed weight sums within some projects (one with 10 crossovers) would have been markedly higher in some projects than in others (one with no crossovers). This could have inflated variances estimates between projects (both overall and within stratum) in a manner analogous to the variance inflation of student estimates considered previously. Thus, at the risk of introducing additional bias, the procedure was applied to the total groups, irrespective of project, in an attempt to further stabilize the estimates.

In defining this adjustment procedure, let

T_u = weight total for originally sampled UB participants,
T_t = weight total for crossovers,
n_u = number of originally sampled UB participants,
n_t = number of crossovers.

Then the smoothed weight, W_j', for individual j, may be expressed as a function of these values and the unadjusted weight as

$$W'_j = \begin{cases} W_j, \text{ if individual is a noncrossover nonparticipant,} \\ \dfrac{T_u + T_t}{n_u + n_t}, \text{ if individual is a crossover,} \\ W_j + \dfrac{1}{n_u} \left[T_t - n_t \left\{ \dfrac{T_u + T_t}{n_u + n_t} \right\} \right], \text{ if individual is an originally sampled UB participant.} \end{cases}$$

It is easily seen that this procedure maintains the total weight sum for those involved in the smoothing.

VI. SUMMARY OF WEIGHT ADJUSTMENTS

The actual techniques employed in weight adjustments have been described in previous sections of this appendix; however, the order in which the various techniques were applied has not been addressed. Weight adjustment was a sequential process, and the nature of that sequence is important to an understanding of the basic character of the resultant weights used in the various analyses summarized in Chapter 3 of this report.[28]

There were nine basic steps in producing the various intermediate and analysis weights of this study. At each step, the weight resulting from the previous step was adjusted by a particular technique; thus, after step 1, the input to any of the adjustment techniques employed was a previously adjusted weight. Due to the basic differences in the adjustment techniques defined above, applying these three techniques in different orders will typically result in different weights. Moreover, some steps in the adjustment process involved removal of certain individuals from the data base (i.e., setting their weights to zero), and the stage at which such individuals were removed would affect the final weight distribution among those remaining.

The first step was adjustment of the raw sampling weights for second follow-up study ineligibility, involving 125 (e.g., 89 former UB participants and 36 nonparticipants). These cases included those who had been determined ineligible for the first follow-up survey[29] and additional individuals who had refused participation or had been reported deceased or incapacitated during the newsletter tracing or returns to the questionnaire mailing/tracing operation. Some of these cases were clearly not defined within the sampling frame of the base-year study, and the associated weights were set to 0. Other cases represented individuals who should have been available for followup but who had refused or could not be identified; sampling weights associated with these cases were therefore appropriately redistributed to other students in the sample (as described in Subsection III.B of this appendix). Deceased sample members were considered to be no longer in the population of interest, and their weights were set to zero.

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[28] Since the weights used for analyses reported in Chapter 4 were not based on original sampling weights but rather on arbitrarily assigned unit weights, they will not be discussed in this section.

[29] See Appendix E of Burkheimer, G. J., _et_ _al_., September 1977. (_op. cit._)

The second weight adjustment step involved a correction for the exclusion from the telephone sampling frame of 308 individuals who had been classified as "hard-core" undeliverables (see Appendix C). This group was comprised of 163 former UB participants and 145 nonparticipants, who should have been considered. Thus, their weights were distributed to similar individuals, as described in Subsection III.B above.

The third weight adjustment step consisted of adjustment for the subsampling of the remaining mail nonrespondents for telephone interview, using the procedure specified in Subsection III.A of this appendix. This adjustment step was confined to the subset of individuals who had not responded by mail at the time of subsampling and resulted in setting to zero the weights of 1,111 nonselected individuals (618 from the former UB participant group and 493 from the nonparticipant group) while increasing the weights of those selected by the appropriate stratum factor.

The fourth step in the process involved adjustment for "instrument nonresponse," which in this case was equivalent to a telephone refusal or a failure to contact by telephone. This adjustment used the procedures defined in Section III.B of this appendix and involved an apportioning of weights of 262 instrument nonrespondents (186 from the former participant group and 76 from the nonparticipant group) to individuals most like them.

The fifth step in the adjustment process involved the correction for 58 additional "ineligible" individuals (50 former participants and 8 nonparticipants) from the data base (i.e., setting their weights to zero). The specific individuals removed were: (a) those who were reported as deceased by telephone, and (b) those with UB participation classification conflicts or inappropriate classification at time of original sampling, as determined from questionnaire responses. Since those selected for telephone interview were to represent those not so selected and since those for whom information was collected by telephone represented those for whom telephone data were not collected, the deceased sample members were removed at this step (after adjustments for subsampling and noncontact) rather than at the earlier step in which other deceased sample members (reported by mail return) were removed.

The removal of cases with conflicting UB participation classification had been anticipated, based on first follow-up findings. The conflicts involved individuals who were originally selected into the participant group but who now indicated they never participated in UB. This group consisted of individuals who were either inappropriately defined in the sampling frame or who did not report their UB participation for some reason (forgot about it or did not wish to report it). Various forms of bias could have entered the results by inclusion of these cases (the type of bias suspected varies with the reason for the conflicting classification), and exclusion of the cases seemed justified.

The sixth step in adjustment was the weight smoothing technique described in Section IV of this appendix. While no cases were lost in this adjustment, 171 individuals[30] who had originally been sampled as nonparticipants were moved to the participant group as "crossovers." The weight total for these

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[30] Of the 210 crossovers identified in this study, 39 had been excluded through previous weight adjustment.

171 cases was almost 6 times that for the 2,604 remaining originally sampled UB participants.

The seventh step in the weight adjustment process involved adjustments for nonresponse or indeterminacy (see Appendix D) of basic classifier variables for the analysis. These included extent of prior UB participation, initial grade cohort, sex, race, poverty status, academic risk status, and over-age-in-grade status. These adjustments involved the reapportioning of weights for a total of 831 individuals (181 nonparticipants and 650 former participants, including crossovers) with data indeterminacies on one or more of these variables by the procedure defined in Subsection III.B of this appendix.

The eighth step in weight adjustments involved corrections for the subsetting of the sample required in certain analyses (e.g., analyses that considered only a particular group of individuals, such as the PSE-entering group). There were several such adjustments, one for each unique subset defined by analysis, and these adjustments involved no more than setting to zero the weights of those individuals that were not included in the subset of interest.

The final step involved weight adjustments for indeterminacy of any additional variables (e.g., criterion variable and additional classifiers, if applicable) specific to each of the analyses involved. Thus, a separate adjustment was made for each analysis performed. The specific number of cases and weight totals for the separate analyses are provided in Appendix H.

Table G.6 presents a summary of the results of the first eight weight adjustment steps,[31] including summary statistics of the weights within the participant, crossover, and nonparticipant groups. This presentation clearly shows the shrinkage of the effective sample size during the several adjustment steps. The table also demonstrates the typically greater disparity between individual weights as more and more adjustments were made; statistical compensation for such disparities typically resulted in larger standard errors.

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[31] For ease of presentation, only two of the several adjustments in Step 8 are provided.

Table G.6

SUMMARY OF WEIGHT ADJUSTMENTS

		Original UB Participants				Crossovers				Nonparticipants			
Step	Adjustment	Number Nonzero Weights	Weight Sum	Minimum Weight	Maximum Weight	Number Nonzero Weights	Weight Sum	Minimum Weight	Maximum Weight	Number Nonzero Weights	Weight Sum	Minimum Weight	Maximum Weight
1	Study Eligibility	3,621	20,657	2.59	10.31	210	120,832	18.32	4,118.34	2,094	1,277,808	18.04	7,394.32
2	Telephone Sample Frame Inclusion	3,458	20,657	2.59	22.62	207	124,691	18.32	4,118.34	1,952	1,273,948	18.04	7,394.32
3	Telephone Sampling	2,840	20,757	2.59	41.50	177	123,012	31.98	6,315.00	1,489	1,292,827	18.32	11,168.60
4	Telephone Nonresponse	2,654	20,756	2.59	46.40	172	123,345	31.98	6,315.00	1,418	1,292,493	18.32	11,168.60
5	Empirically Determined Study Eligibility	2,604	20,426	2.59	46.40	171	121,799	31.98	6,315.00	1,411	1,286,334	18.32	11,168.60
6	Weight Smoothing	2,604	133,460	46.00	89.80	171	8,764	51.25	51.25	1,411	1,286,334	18.32	11,168.60
7	Indeterminacy of UB Participation Pattern	2,500	133,241	46.00	175.80	171	8,983	51.25	109.70	1,386	1,286,334	18.32	11,168.60
7	Indeterminacy of Other Major Classifiers	2,015	136,139	46.00	994.80	110	7,849	51.25	198.20	1,230	1,284,571	18.32	12,425.90
8	Subsets of High School Graduates	1,969	133,067	46.00	994.80	107	7,682	51.25	198.20	1,168	1,220,330	18.32	12,425.90
8	Subset of PSE Entrants	1,641	110,265	46.00	994.80	70	5,262	51.25	198.20	746	760,281	19.33	12,425.90

Appendix H

Procedures and Results of Comparative/Descriptive Analyses

Appendix H

Procedures and Results of Comparative/Descriptive Analyses

I. GENERAL

This appendix particularizes the comparative/descriptive analyses leading to the findings reported in Chapter 3 of this report. Specifically emphasized are: (a) the general approach to analysis, (b) constraints and limitations of the analyses, and (c) tabular presentations of analysis results. Topics that are closely related to these analyses are detailed elsewhere: weighting adjustments, in Appendix G; and data reliability and analysis variable specifications, in Appendix E.

The comparative/descriptive approach is descriptive in the sense that estimates were produced, for both UB participants and nonparticipants, of group characteristics (e.g., pertinent experiences, characteristics of PSE institutions attended), and comparative in that group or subgroup differences on outcome or criterion variables were estimated as a function of the pattern of UB participation; in such comparisons, nonparticipants may be classified as individuals with a pattern of no participation in UB.

Each of the analysis questions of this study was addressed by these analyses. While the comparative/descriptive analyses were similar in form to the analyses of participant and nonparticipant differences performed in the base-year[1] and First Follow-up[2] studies, the Second Follow-up analyses differed considerably from previous ones in terms of the specific techniques used.

Using the student as the unit of analysis, aggregate differences in the outcome variable measures were examined within a general linear model as a function of pattern of UB participation, with statistical control (covariance adjustment) of a set of concomitant variables (specifically, student background factors).[3] Additional control was maintained in many analyses through performing analyses within specific subsets of individuals partitioned on the basis of other control variables (e.g., grade cohort, type of institution attended). The results of these analyses reflect the overall relationship between participation in the UB program and student outcomes, controlling for differences in input to the program.

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[1] Burkheimer, G. J., Levinsohn, J. R., Koo, H. P., and French, A. M. Evaluation Study of the Upward Bound Program (Volume IV of A Study of the National Upward Bound and Talent Search Programs. Four Volumes). Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, April 1976. (ED 131-152)

[2] Burkheimer, G. J., French, A. M., Levinsohn, J. R., and Riccobono, J. A. Evaluation Study of the Upward Bound Program: A First Follow-up. Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, September 1977.

[3] The comparison population was defined as all nonparticipants enrolled in the tenth, eleventh, or twelfth grade of high schools served by a UB project in September 1973. There was no reason to believe, however, that the distributions of this population by grade or by relevant background characteristics would be exactly the same as those of the UB student population, and, as shown in Table H.1 of this appendix, the groups differed markedly on some such factors.

In prior comparative/descriptive analyses, statistical control for differences between participants and nonparticipants was obtained through a form of balancing.[4] The degree of additional statistical control required by the current study (e.g., control within each of the patterns of UB participation, and control within types of PSE institutions), could not be accommodated by the previously-used technique. Thus, the more common approach to statistical adjustment (covariance adjustment for main effects through a general linear model approach) was employed. Although more factors could be adjusted by this technique, it should be recognized that none of the interactions of those factors were considered, as had been accomplished by the previous technique.

In general, the comparative/descriptive analyses were restricted to the examination of single-degree-of-freedom contrasts of relevant means or proportions for a given outcome measure. Omnibus tests for main effects or interactions were not implemented; rather, meaningful differences in percentages or means between relevant subpopulations were considered. For each difference (single-degree-of-freedom contrast) an appropriate standard error was calculated, allowing for sampling effects, to provide confidence limits and thus a means of testing for statistical significance of the difference.

Some analyses were performed within initial grade cohort, since certain educational outcomes (e.g., educational progress) were restricted in the value they could assume by the sample members' educational starting point during the base-year study. Other analyses were performed for the total participation pattern groups, combined over grade cohorts, with appropriate adjustments. Additional partitioning of groups on other factors was undertaken to the extent possible, particularly in examining PSE outcomes when such factors (e.g., institutional level of offering) were considered to be logically related to the outcome under consideration. For most major analyses, the specific a priori contrasts constructed within a given partition of the groups were those reflecting major USOE interest (i.e., the contrasts between the typical and atypical participant groups and between the typical participant group and the nonparticipant group).

The group of individuals who were originally identified as nonparticipants but who subsequently reported participation in UB (subsequently called "crossovers") were considered for the first time in these analyses. Because of the large differences in analysis weights between former participants and nonparticipants (reflecting markedly different selection probabilities) and the fact that these individuals could no longer legitimately remain in the nonparticipant group, they had been excluded from first follow-up analyses. In the current study, a methodology for incorporating these individuals into the participant group was implemented (see Appendix G).

To provide unbiased estimates of population parameters, sampling weights (the inverse of the probability of selecting the individual) were used in analyses. The use of sampling weights overcomes possible bias in resulting statistical estimates which may be introduced because individuals were selected with unequal probability (due to oversampling of specific groups). Two conceptually different weight adjustment procedures were used to achieve more meaningful results (see Appendix G). The first procedure is a technique of weight smoothing that allowed consideration of the crossovers without unduly influencing the results by their disproportionately large sample weights. The second procedure involved the adjustment of sample weights for the sampling procedures used, for instrument nonresponse, and for item indeterminacy. The weight adjustment approach, which involved apportioning of sampling weights of non-selected and nonresponding individuals to those of selected and responding individuals, was chosen over several less conservative imputation approaches.

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[4] After the comparison group had been adjusted to reflect the same distribution of sex, race, poverty status, academic risk status and grade cohort as the UB participant group, comparisons were made between the groups using software developed specifically for the UB evaluation study, which compensated for the adjustment technique. See Appendix E of Burkheimer, et al., 1977, (op. cit.).

The basic approach used in analysis was multiple regression, a very general statistical technique whereby the relationship of one variable to a set of other variables may be assessed.[5] Generally, the technique allows the determination of that linear combination of those variables in the predictor set which best predicts (shows the greatest zero-order correlation with) the single criterion variable. In determining the best linear combination of the predictor variables, it is important to go beyond the simple zero-order relationship of each individual predictor to the criterion. Rather, the approach considers the relationship of a predictor variable to the residual portion of the criterion variable that remains when the prediction of all other variables in the predictor set has been removed (partialed).

Aside from the various theoretical and philosophical issues involving the validity of inferences from surveys, the basic problem of producing unbiased estimates of regression parameters and estimates of the associated standard errors has been a particularly thorny issue in dealing with results from stratified multistage sample designs such as the one used here. Most of the available statistical software packages treat the sample as independent random observations, ignoring the sample design. This approach is convenient, but it is inappropriate, since it does not account for unequal probabilities of selection. The application of sampling weights is possible through some software packages, allowing correct estimates of regression coefficients, but appropriate error variance estimates typically are not produced. In fact, it is not possible to obtain explicit expressions for variance estimates of complex estimators such as regression coefficients within complex survey sample designs; however, there are various approximation procedures available. While there is no single "best" way to approach the matter, RTI has developed an approach that is considered optimal or near optimal in most circumstances. The approach combines the use of the Horvitz-Thompson estimator[6] and Taylorized deviation[7] which have been incorporated into a statistical software routine.[8]

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[5] See, for example, Draper, N. R. and Smith, H. Applied Regression Analysis. New York: Wiley, 1966.

[6] Horvitz, D. G. and D. G. Thompson. A Generalization of Sampling Without Replacement from a Finite Universe, JASA, 1952, 47, pp. 663-685.

[7] Folsom, Ralph E., Jr. National Assessment Approach to Sampling Error Estimation, Sampling Error Monograph, Project No. 25U-796-5, Research Triangle Park, N.C.: Research Triangle Institute, 1974.

[8] Holt, Mary M. SURREGR: Standard Errors of Regression Coefficients from Sample Survey Data, Research Triangle Park, N.C.: Research Triangle Institute, May 1977.

Although the Horvitz-Thompson estimator is not the "best" estimator in all cases, neither is any other estimator. Moreover, the Horvitz-Thompson estimator is widely used and has been found to be an admissible estimate. The Taylorized deviations approach is also not necessarily the "best" approximation procedure; but it does possess some practical and computational advantages over other available techniques (e.g., independent replications, pseudoreplications, or jackknife techniques). The Taylorized approach is, however, less known and is detailed in Subsection III.B of this appendix. While the procedure is an appropriate one, it imposes certain additional restrictions on analysis, particularly in regard to the degrees of freedom (and thus the number of parameters) available to the regression model and in regard to the use of variables in the model that were used in defining the original sampling strata. Specifically, models involving more than 25 regression degrees of freedom could not be analyzed by this procedure.

II. CONSTRAINTS AND LIMITATIONS OF ANALYSES

Care was taken throughout analysis to avoid techniques or comparisons that would introduce bias in results that was either favorable or unfavorable to the UB program. Also considerable effort was made to ensure that the data entering analysis were error free and consistent (see Appendix E). The original sample was designed to reduce many of the possible differences which could exist between the UB and comparison samples (and which, therefore, could lead to spurious group differences). Additionally, statistical control was undertaken in an attempt to reduce possible contamination of the results by existing differences between groups on background factors, initial grade distribution, and other factors. Weight adjustments for indeterminate response at the instrument and item level were employed in an effort to avoid distortion of the findings due to incomplete data collection. Standard errors were computed for all major differences so that probability statements concerning the populations of interest could be made and statistical significance of differences could be assessed.

Although it is quite likely that these efforts were at least partially successful, they did not ensure removal of all possible confounding factors, nor did they eliminate all constraints and limitations on the study findings. The analysis technique used is a relatively complex approach to general linear modeling and is subject to specific limitations. The technique assumes specific distributional properties of the variables analyzed, which were met only to varying degrees. Particularly, the assumptions of multinormal distributions and homoscedasticity of error are probably violated. Moreover, scale properties of some of the variables analyzed were not sufficiently strong to meet the assumptions of the analytic models (e.g., assumed ordinal scale properties were not always met). While none of the specific violations of model assumptions were considered to be critical (in fact, most represent generally accepted practices), the several violations, in combination, could lead to spurious results.

There are also several other potential sources for error in the statistics computed. Measurement error is an obvious source of such error and is addressed in Subsection II.A, below. Another source is sampling error, which is reflected in almost any estimate of a population characteristic from data collected from a sample of that population. This error is introduced by the fact that the computed estimate will vary from one specific sample to another. Sampling error is typically incorporated in statistical tests of reported differences, through one or another assumptions about the characteristics of the error under the sampling procedure used (see Subsection III.B). Sampling errors were not computed, however, for the point estimates computed within a specific participation pattern group. As a result, such point estimates should be considered only as approximations, varying from the true population values as a result of sampling error.

The potential for bias in the results also exists. Bias is typically introduced through a systematic misrepresentation of the population in the sample. While the full sample drawn in the base-year study would have led to unbiased estimates, this is not necessarily the case for subsets of the full sample. It is known that the weight smoothing technique applied to allow consideration of crossovers introduced bias into the results (see Appendix G). Also, when data collected include nonresponse and/or less than complete coverage of the sample, then the potential for bias exists when making population estimates from the subset of individuals who have provided data. It is quite likely that nonresponse or other factors leading to data unavailability (e.g., sample attrition since the base-year study) is not random and that bias has been introduced in some point estimates. There is little indication, however, that any nonrandom sample loss was systematically different for former participants and nonparticipants, thus differences between these two groups may show less bias than the estimates within each group, from which the difference is formed. If the bias is constant for both groups, then it effectively cancels itself when a difference is formed.

Two particularly difficult remaining confounds are associated with the relationships between pattern of UB participation and other variables used in the study. There are also specific constraints involving the statistical adjustments performed. Further, two basic problems inherent in questionnaire surveys remain: namely, questionable validity of reported information and the inability to definitively establish causation. These limitations on the study findings are considered below in some detail.

A. Validity of Data

Much of the data for this study is based on unverified self-reports or, in some cases, reports from secondary sources. In addition to known biases in student reports of academic achievement, invalid responses may be traced to a diversity of possible sources (e.g., deliberate attempts to mislead, lack of understanding or misinterpretation of questions, and simple errors in marking responses). Additional (or different levels of) errors are introduced when secondary source data are considered. Additionally, some error may be introduced in transcribing the data provided. No direct validation of collected data was attempted; validation studies, while theoretically very important, are typically not cost-feasible. Three efforts were attempted to assess data quality; two of these involved examinations of data reliability (a necessary but insufficient condition for validity). One examination involved the comparison of responses on duplicate questionaire returns; another involved checks for determinacy and internal consistency of questionnaire data. The final approach examined intercoder reliability in abstracting data from the PSE transcripts. These studies are detailed in Section VII of Appendix E.

Examinations of duplicate returns indicated a relatively high degree of agreement in reports of relatively objective information (e.g., high school completion, PSE entry) but considerably less agreement in reports of more subjective information (aspirations, problems experienced), reflecting in part the temporal instability of these latter measures. Also, this examination revealed a low reliability of reported amounts of financial aid received (which was anticipated on the basis of pretests of the questionnaire).

Data indeterminacy was considered to be within tolerance levels for most data elements; however, indeterminacy rates exceeded 15 percent for six variables considered. The items with greatest indeterminacy rates were those related to financial aid and educational expectations or aspirations. Some of the indeterminacy problems were "fixed" through logical imputations, introducing potential for another type of error into the results; however, in all but one instance (again educational aspirations) the amount of data that was imputed was less than 5 percent. Examination of data consistency was possible for some items of information. For the items considered, consistency was quite satisfactory in most instances; however, the consistency checks were only capable of detecting very large response discrepancies (see Appendix E). Greatest inconsistency existed in reported UB participation as compared to previously established participation. Although these inconsistencies may be somewhat artifactual,[9] they nevertheless signal the possibility of a considerable lack of reliability in the retrospective measure of program participation.

Although the data as it existed on student transcripts may be assumed quite reliable, the process of abstracting these data for the current study provided a source of considerable potential for error. The examination of intercoder reliability indicated that this potential had been realized in several cases. Although the estimated reliability of most major variables was satisfactory, particular problems were experienced with major course of study and with variables that were conditional on classification within a particular content area (e.g., GPAs within content area). In the latter case, reliability was so poor that certain planned analyses were not implemented.

The problem of data validity may have been compounded through the weight adjustment procedures, particularly if invalid data were collected from a student who was similar to a large group of nonrespondents. The real danger of the validity problem, however, is that of differential validity of responses within the two groups (UB and comparison). While a lack of reliability and validity serves to introduce error into the data, if this error is the same (regardless of direction or magnitude) within the UB and comparison groups, then group differences should show no directional bias. If, on the other hand, the data from one group are biased in a particular direction and those from the other group are unbiased (or biased in the opposite direction), then the bias will remain (or be magnified) in the group differences. None of the reliability or consistency checks were sufficient to address this issue, and, while there is no reason to suspect differential response biases, the possibility of this source of error in group differences does exist.

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[9] Few of the inconsistencies represented a conflict in whether the individual had or had not participated in UB; for former nonparticipants, this was a legitimate possibility (i.e., crossovers). There were numerous cases, however, for which the particular pattern reported differed from that reported in the First Follow-up Study.

B. Establishing Causation

A logical error which is made with sufficient frequency to warrant discussion is that of inferring causality from an established relationship. While the existence of a relationship between two variables is a necessary condition for the existence of causation, it is not a sufficient one. In addition to a relationship between two variables (conditions), establishing causation requires that: (1) the causal variable (antecedent condition) logically precedes the effect (consequent condition); and (2) no other antecedent variable exists which may explain both the antecedent and consequent variables under consideration. While the first of these requirements is often fairly easy to establish, the second is extremely difficult to establish outside the true experimental paradigm. Although advances have been made recently in the area of causal modeling for nonexperimental or quasiexperimental research paradigms, the assumption of inclusion of all relevant variables in the model is a basic tenet in these approaches.

For educational intervention programs, it is extremely difficult, if at all possible, to identify (much less to measure) all the relevant student, process, and contextual variables which may influence one another and/or student outcomes. The UB program is no exception to this constraint. Moreover, the nature of sample selection and measurement used in the UB evaluation study was such that it was not possible in all cases to determine even the temporal order of occurrence of two events. Even when strong associations exist between previous UB participation and current outcomes, the possibility still remains that these associations are largely a function of other unconsidered (or unmeasured) antecedent variables which are related both to current outcomes and to selection of UB participants.

C. Limitations Concerning the UB Participation Pattern Variables

Most analyses considered pattern of participation in the UB program; this variable suffers some confounding in relationship to other variables. Eight unique participation patterns (including nonparticipation as a pattern) were possible in all. The eight patterns are indicated in Figure H.1. Two separate classifications of UB participation pattern were examined; one yielding two groups of former participants (typical and atypical) plus a group of nonparticipants, the other yielding four groups of former participants in addition to the nonparticipant group. The relationship of the unique patterns to the first classification is indicated by letters in Figure H.1 (NP = nonparticipant; A = atypical participant; and B = typical participant). The second classification is indicated in Figure H.1 by circled numbers. It is obvious that both of the considered classifications necessarily involved collapsing of unique participation pattern groups; as a result, some heterogeneity of unique patterns exists within the two partitionings considered for analysis.

More importantly, some participation patterns are confounded with grade cohort (e.g., grade level in fall of 1973), in that not all unique patterns are possible in a given grade. Impossible patterns are indicated by an X in Figure H.1. As an example, an individual selected as a participant in the 10th grade could legitimately exhibit only patterns including 10th grade participation: (1) 10th grade only, (2) 10th and 11th grade, (3) 10th and 12th grade, (4) 10th, 11th, and 12th grade. Similar confounds exist for other cohorts. Even though the approach taken in this study allowed for nonparticipant crossovers, which relaxes some of the constraints on possible participation

	Unique Participation Pattern							
	No Participation	Tenth Grade Only	Eleventh Grade Only	Twelfth Grade Only	Tenth and Eleventh Grades	Tenth and Twelfth Grades	Eleventh and Twelfth Grades	Tenth, Eleventh, and Twelfth Grades
Grade 10	NP ①	A ②	X	X	A ②	A ③	X	T ⑤
Grade 11	NP ①	X	A ②	X	A ②	X	T ④	T ⑤
Grade 12	NP ①	X	X	A ③	X	A ③	T ④	T ⑤

Figure H.1. Confounding of Upward Bound participation pattern and grade cohort.

pattern within a given cohort, the number of crossovers was so small that any unique pattern defined exclusively by crossovers typically had to be collapsed into another pattern classification.

Because of the constrained nature of participation pattern as a function of original cohort, analyses that did not also consider cohort may be misleading. Even though some statistical control for cohort was exercised in such analyses, the meaning of UB participation category varies as a function of cohort, suggesting an interaction, and marginal adjustment for cohort does not account for that particular confound.

One very disturbing problem with the participation pattern by grade confound was a relatively large group (N = 233) of former participants who were initially selected into the twelfth-grade cohort but who reported no twelfth-grade participation in the UB program, which is not a legitimate pattern. Only a small percentage of this group could be attributed to individuals with prior UB participation who were inappropriately selected into the nonparticipant sample. Given the sample selection process (see Appendix C), these individuals may represent those who were in the program during the summer prior to their senior year (and were still on the roster when the sample was drawn), but who did not continue their participation during their senior year. They may also represent individuals who did not report their twelfth grade participation for one reason or another. In either case, however, they represent an unusual group.

An additional problem with the UB participation pattern variable is associated with the temporal relationship between participation pattern and educational progress/persistence. While different patterns of participation in the program may be seen as theoretically preceding further educational progress, this is not necessarily the case. In particular, dropping out of high school (cessation of educational progress) leads to termination (and thus limitation) of program participation. This would likely produce over-estimates of relationships of participation pattern to educational outcomes. For this reason, examination of educational outcomes beyond high school graduation (e.g., entry into postsecondary education) was restricted to high school graduates. While this reduced the severity of the problem, it did not completely eliminate it. For example, a high school "stop out" could ultimately complete high school at a later time; the "stop out" that contributed to the atypical UB participation pattern would also introduce a time lag that would be reflected in subsequent educational progress.

Another type of confounding is related to the so-called "survivor effect," which is a form of group self-selection. As an example, consider the comparison of the educational progress of two groups of twelfth graders, one group consisting of individuals who joined UB for the first time during their senior year and the other consisting of those who participated in UB in the tenth, eleventh, and twelfth grades. The groups being compared would be basically different (even if equated on certain background factors), since one is comparing students who "survived" on their own in a school system through which the other students had been specifically assisted (i.e., to become seniors). If this survivor effect is large, then valid comparisons could only be made among those joining the program in the same grade or after controlling for the effect. Such control has not been accomplished in this study except within the tenth-grade cohort.[10] There is an obvious interaction between this confound and that discussed in the previous paragraph.

While the statistical approach and methodology employed represented an attempt to reduce, to the extent possible, problems inherent in the use of UB participation pattern as the major explanatory variable for the study, complete control was not realized, as indicated in the preceding discussion. Associated limitations in the analytic results should be anticipated.

D. Limitations of Adjustments

The approach used for these analyses relies heavily on the efficacy of the statistical adjustments, and is thus bound to the assumptions of those techniques. Although statistical adjustments were effected for the set of available measures, there is no guarantee of control over other basic differences between the participant and nonparticipant group. The use of single-degree-of-freedom contrasts, as opposed to omnibus tests, also has disadvantages in that *a priori* contrasts may not fully exploit the nature of the available data, and may thus obscure other results of interest, particularly interactions.

Complex statistical adjustments were performed in conducting the comparative/descriptive anslyses, and, in general, the computed standard errors compensated for the assumptions of the adjustment techniques. Nevertheless, the extent to which adjustments could be made were limited. Two basic types of adjustment were performed: (1) weight adjustments for nonresponse and item indeterminacy, and (2) statistical adjustments for the effects of variables related to both UB participation pattern and to an outcome under consideration.

Weight adjustments, in general, were "weighting class" adjustments, consisting of apportioning the sampling weights of individuals with indeterminate data to responding individuals "most like" the nonrespondent (i.e., in the same weighting class). This technique assumes that most of the nonresponse bias is captured within the categories defining "most like" (i.e., the weighting class). This assumption is more reasonable for some types of nonresponse than others; however, nonrespondents differ even from similar respondents by virtue of their nonresponse.

Weight adjustment cannot be expected to eliminate all nonresponse bias, however, except under the most trivial circumstances. The group of nonrespondents considered most problematic for this study are those who could not be located (representing sample attrition). Intuitively, less educational progress would be expected from this group than from those with whom contact was maintained. Further, the weight smoothing technique used to compensate for the nonparticipant crossover greatly increased the total weights of the former participant group (although weights for any individual originally selected as a participant relative to the total group remained stable). For this reason, estimates of total counts within the former participant groups are not considered valid. As a result of these problems, estimates of educational progress may be artifactually high.

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[10] Strictly speaking, this confound is also present for comparisons between UB participants and nonparticipants. In this respect, the Markov model approach used in the base-year study was theoretically more appropriate, despite its acknowledged weaknesses.

Statistical control was also implemented for differences among former participants and nonparticipants on background and contextual factors thought to be related to educational attainment or success. Significant differences among the groups in these areas were documented in the base-year and first follow-up studies and are shown in Table H.1 (Section IV). The statistical adjustment techniques used in the second follow-up--consisting of covariance adjustment and partitioning of sample groups--introduced some problems. For one, the available analytic methodology in combination with the original sampling procedures placed stringent limits on the number of variables for which covariance adjustments could be made. Since the procedure uses within stratum estimates for the error term and since only 27 strata were defined, only 27 degrees of freedom remain to accomodate both the contrast of interest and control variables. Additionally, base rates for some variables severely limited the extent to which partitioning could be employed, while maintaining adequate cell sizes. Even greater constraints on cell sizes than would normally be imposed were introduced for appropriate calculations of standard errors, which relied on within strata estimates.

Two basic compromises were made in performing the statistical adjustments. First, covariance adjustments were restricted to marginal distributional properties; joint distributional properties (which were considered in prior studies and which allow for variable interaction) were not considered. Second, partitioning was much more restricted than would have been desired. Thus, while statistical adjustment was introduced for more variables than had previously been possible, control was not realized for the full set of potential moderating variables, and, for some factors, control was not realized to the same extent as had been achieved in previous studies. Consequently, the potential for attributing effects of some uncontrolled or only partially controlled variable to UB participation pattern is high. Although this limitation is characteristic of nonexperimental research, it should be kept in mind when considering the results.

III. ANALYTIC APPROACH

The basic analytic approach used for the comparative/descriptive analyses was specified jointly by RTI and OPBE during an early stage of the study.[11] These specifications were intended to facilitate actual conduct of analysis but were not intended to constrain investigations; thus, some deviations from the original plan were realized once data were in hand and analysis had begun. Analysis was constrained, however, by the general design of the base-year study (see Appendix C), by the set of data collected (see Appendix E), and by the specific analysis questions to be addressed by the study.

A. Basic Approach

Due to USOE's desire to introduce statistical control for pattern of UB participation and type of PSE institution attended, the balancing techniques developed in conjunction with analyses performed previously were no longer applicable owing to limitations in the original sample design. Thus, an alternate approach to adjustment was adopted with the approval of OED. The basic features of this alternate approach and its use in producing tabular results for the comparative/descriptive analyses are considered in this subsection.

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[11] Burkheimer, G. J., Fuentes, E. J., Riccobono, J. A., and Wisenbaker, J. M. Data Analysis Plan for the Second Follow-up Study of the Upward Bound Program. Research Triangle Park, N.C.: Center for Educational Research and Evaluation, Research Triangle Institute, March 1979.

Fundamentally, the approach that was employed is based upon regression analysis, although it supported the development of tabular results. Within a particular partition[12] of sample members, the general model for some outcome variable, y, for some individual, k, may be expressed as follows:

$$y_k = \mu_y + f(v_1, \ldots, v_i)_k + g(x_1, \ldots, x_j)_k + \varepsilon_k$$

where

$(v_1, \ldots, v_i)_k$	represent the values, for individual k, of coded variables based on the particular categorization of UB participation pattern under consideration,
$(x_1, \ldots, x_j)_k$	represent the values, for individual k, of control variables associated with the outcome of interest,
$f(\cdot)$ and $g(\cdot)$	are least squares linear combinations of the two sets of variables,
μ_y	represents the grand mean for the outcome variable of interest,
ε_k	represents the error in predicting y_k.

It should be noted that the model allows for no interaction terms within the set of control variables $(x_1, \ldots, x_j)$ or between these variables and UB participation pattern. Interactions involving the partitioning variable(s) were allowed, of course, since separate analyses were performed within each partition.

Initially, $(v_1, \ldots, v_i)$ was parameterized so as to capture the difference between a base UB participation group of interest and each of the other groups in the same partition (defining a unique value of a control variable). The particular coding used was dummy coding, which for ℓ levels of the UB participation pattern categorization (i.e, $\ell = 3$ or 5 as suggested above in Figure H.1) produces ℓ-1 dichotomous (0,1) variables. Each of the ℓ-1 dummy variables results from coding one UB participation pattern group as 1 and all remaining groups as 0. The base group is the only group that is coded 0 for all ℓ-1 dummy variables. For the three-valued participation pattern categorization, "typical" participants were used as the base group; for the five-valued participation pattern categorization the base group was those who participated in grades 10, 11, and 12 (pattern 5 of Figure H.1).

Under this parameterization, the estimated regression coefficients associated with $(v_1, \ldots, v_{\ell-i})$ serve as an estimator of the difference between the mean of a particular participation pattern group and that of the base group; the standard error of the regression coefficient estimates the standard error of the difference between these two groups. Since the coefficients for the control variables $(x_1, \ldots, x_j)$ are estimated simultaneously, the coefficients associated with $(v_1, \ldots, v_{\ell-i})$ actually reflect adjusted group differences, holding the marginal effects of other variables constant.

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[12] Recall that additional statistical control was gained by analyzing relationships within separate partitions of the sample. Partitions were based on values of the variable(s) for which control was to be realized.

This information was incorporated into the tables of the comparative/descriptive analysis to produce estimated cell means adjusted for the control variables of interest (including the partitioning variable defining the rows of the table). This was accomplished by first computing the actual mean of the specified base participation pattern group in the row under consideration; that value is reported in the table. For each other cell in that particular row, two cell entries appear: the actual mean of the group, and an estimated (adjusted) mean obtained by adding the adjusted mean difference (between the group of interest and the base group) to the actual mean of the base group.

For analyses involving comparisons among the three-valued UB participation pattern categorization, the dummy coding approach, specified above, provided a parameterization that was sufficient for both producing table entries and testing specific contrasts desired by USOE. The contrasts involved differences between typical participants and (1) atypical participants, and (2) nonparticipants. For the five-valued UB participation pattern categorization, specific contrasts desired by USOE did not correspond completely with those employed to generate adjusted cell means. Moreover, when grade cohort was considered as a partitioning variable, the particular contrasts within one grade were not the same as those within another grade due to the confounding of participation pattern and grade cohort (see Table H.1).

To achieve the desired contrasts (contrasts considered in each analysis are indicated for each table in Section IV), alternative coding (difference contrasts) as required. The alternate coding produced an additional set of regression weights (appropriate to the specified contrasts) for the alternate parameterization $(v'_1, \ldots, v'_{\ell-1})$. In producing the alternate parameterization, care was taken to assure that the full set of contrasts (including those of interest) were orthogonal. The estimated standard errors associated with the solution for the alternate parameterization served as the standard errors for the contrasts of interest, and the estimated regression weights provided the point estimate of the difference contrast.

Due to the complex probability sampling employed in the selection of respondents in the base year study, standard regression analysis using ordinary least squares estimation was inappropriate. While a weighted least squares approach employing sampling weights (or adjusted sampling weights), could have provided appropriate point estimates, the associated standard errors from such an approach would not have reflected the design effects associated with the original stratification and clustering of the respondents and may have been spuriously large or small, depending on the magnitude of that design effect.

RTI had previously developed an approach to regression analysis appropriate for use with data such as these, which arise from complex sampling designs, and had produced software to implement the approach. In using this approach, which estimates error from within stratum variability, the degrees of freedom available for analysis are constrained by the number of strata and primary sampling units in the design (see below, Subsection III.B). In the present instance there are 27 degrees of freedom with which to operate. The implication for analysis was that the most complex model estimated could have no more than 26 parameters. Since each variable considered in adjustment counts as at least one parameter[13] to be estimated, relatively few control variables could be considered, even after restricting adjustment to the marginal effects for the control variables present.

With respect to the particular tables produced in the present study, this constraint was not generally a problem. Tables had at most 15 cells; the contrasts therefrom would consume no more than 14 degrees of freedom. Sufficient degrees of freedom remained for inclusion of the control variables of interest to USOE (specifically, race, sex, poverty status, academic risk status, grade cohort, and age within grade).

A particularly difficult situation existed in dealing with the case in which a table represented displays of column proportions (e.g., the distributional characteristics of a categorical outcome variable within specific participation pattern groups). The approach used in this case was to perform j separate analyses in which a dichotomous variable was predicted (e.g., separate analysis of column proportions for each of the j rows of the table). The value of the variable for the subjects in the i^{th} row was 1 if a subject was classified in level i and a 0 if not. While this yielded j separate--but not independent--analyses for each of these tables, it was the only readily-available approach whereby the control variables could be incorporated while generating approximately appropriate standard errors.

B. Taylor Series Linearization for Regression Coefficients

1. Population Definitions

Consider a finite universe U with N units U(i). Associate with the i-th unit a variate value Y(i) and a row vector of (p+1) regressors

$$X(i) = \langle X_o(i), X_1(i), \ldots, X_p(i) \rangle.$$

The linear prediction equation for Y(i) of the form

$$y(i) = X(i)\beta,$$

which minimizes the sum of squared deviations

$$Q^2 = \sum_{i \varepsilon U} [Y(i) - X(i)\beta]^2,$$

is the familiar least-squares regression equation where β is a solution to the so-called 'normal equations'

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[13] Continuous variables generate one degree of freedom; however, categorical variables (most of the variables to be considered) generate k-1 degrees of freedom, where k is the number of unique categories defined by the variable.

$$(X^TX)\beta = X^TY, \tag{H.1}$$

where

$$X^TX \equiv \sum_{i\varepsilon U} X^T(i)X(i),$$

and

$$X^TY \equiv \sum_{i\varepsilon U} X^T(i)Y(i).$$

If X^TX has rank p+1, there is a unique solution for β in H.1; namely

$$\beta = (X^TX)^{-1}\ X^TY.$$

If the p+1 equations represented by the matrix equation H.1 are not linearly independent, redundant equations can be replaced by independent linear restrictions on the elements of β. While the following development is limited to the full rank case, it is not difficult to extend the results directly to a particular restricted solution.

2. Estimation

Suppose that a sample S of n units is selected from the universe U. Let $\pi(i)$ denote the probability that unit U(i) will be included in such a sample. Unbiased Horvitz-Thompson estimators for X^TX and X^TY are

$$(x^Tx) = \sum_{k\varepsilon S} X^T(k)\ X(k)\ /\pi(k),$$

and

$$(x^Ty) = \sum_{k\varepsilon S} X^T(k)\ Y(k)\ /\pi(k).$$

Using these estimators, we solve for b in the estimated set of normal equations, (H.1)

$$(x^Tx)b = (x^Ty).$$

As an esimator of β, the population vector of regression coefficients, $b = (x^Tx)^{-1}\ (x^Ty)$ can be viewed as a matrix version of the combined ratio estimator $\hat{R} = (\hat{X})^{-1}(\hat{Y})$. This analogy will be strengthened by the form of the Taylor series approximation for $(b-\beta)$.

3. Taylor Series Variance Approximation

To generate the first order Taylor series approximation for b, one begins by evaluating the partial derivatives

$$\partial b/\partial(x^T y)_j, \qquad \text{for } j = 0, 1, \ldots p,$$

and

$$\partial b/\partial(x^T x)_{jj'}, \qquad \text{for } j = 0, 1, \ldots p,$$
$$j' = j, j + 1, \ldots p,$$

where $(x^T y)_j$ represents the j-th element in the (p+1) x 1 column vector, $(x^T y)$ and $(x^T x)_{jj'}$ is the (jj')-th element of the (p+1) x (p+1) symmetric matrix $(x^T x)$.

First, notice that

$$\{\partial(x^T x)b/\partial(x^T y)_j\} = (x^T x)\ \{\partial b/\partial(x^T y)_j\}$$
$$= \partial(x^T y)/\partial(x^T y)_j.$$

Therefore

$$(x^T x)\ \{\partial b/\partial(x^T y)_j\} = \delta_j,$$

where

$$\delta_j(r) = \begin{cases} 1 \text{ if } j = r; \\ 0 \text{ otherwise.} \end{cases}$$

This allows one to write

$$\{\partial b/\partial(x^T y)_j\} = (x^T x)^{-1}\delta_j. \qquad \text{(H.2)}$$

Notice that δ_j is a (p+1) x 1 column vector with a 1 in row j and zeros elsewhere. To evaluate the partial derivative of b with respect to the elements of $(X^T X)$ we note that

$$\{\partial(x^T x)b/\partial(x^T x)_{jj'}\} = \partial(x^T y)/\partial(x^T x)_{jj'} = 0.$$

Hence,

$$(x^T x)\ \{\partial b/\partial(x^T x)_{jj'}\} + \{\partial(x^T x)/\partial(x^T x)_{jj'}\}\ b = 0.$$

Recalling that $(X^T X)$ is symmetric, observe that

$$\{\partial(x^T x)/\partial(x^T x)_{jj'}\} = D_{jj'},$$

where the (r,c)-th element of $D_{jj'}$ is

$$d_{jj'}(rc) = [1 - \delta(jj')]\ \delta_j(r)\delta_{j'}(c) + \delta_{j'}(r)\delta_j(c),$$

with $\delta(jj') = 1$ if $j = j'$ and zero otherwise. This leads to

$$\{\partial b/\partial(x^Tx)_{jj'}\} = - (x^Tx)^{-1}D_{jj'}b, \qquad \text{(H.3)}$$

where $D_{jj'}$ is a (p+1) x (p+1) symmetric matrix having 1s in positions (jj') and j'j) and zeros elsewhere.

Evaluating the partial derivatives in equations H.2 and H.3 at the point $<(x^Tx) = X^TX;\ (x^Ty) = X^TY>$, b may be approximated with the first order Taylor series linearization

$$b \doteq \beta + \sum_{j=0}^{p} [(x^Ty)_j - (X^TY_j)]\{\partial b/(x^Ty)_j\}$$

$$+ \sum_{j=0}^{p}\ \sum_{j'=j}^{p} [(x^Tx)_{jj'} - (X^TX)_{jj'}]\ \{\partial b/\partial(x^Tx)_{jj'}\},$$

which becomes

$$b \doteq \beta + (X^TX)^{-1} \sum_{j=0}^{p} [(x^Ty)_j - (X^TY)_j]\ \delta_j$$

$$- (X^TX)^{-1} \sum_{j=0}^{p}\ \sum_{j'=j}^{p} [(x^Tx)_{jj'} - (X^TX)_{jj'}]D_{jj'}\beta. \qquad \text{(H.4)}$$

Recalling the definitions of δ_j and $D_{jj'}$ it is easy to see that

$$\sum_{j=0}^{p} [(x^Ty)_j - (X^TY)_j]\ \delta_j = [(x^Ty) - (X^TY)],$$

and

$$\sum_{j=0}^{p}\ \sum_{j'=j}^{p} [(x^Tx)_{jj'} - (X^TX)_{jj'}]\ D_{jj'} = [(x^Tx) - (X^TX)].$$

Thus, equation H.4 may be rewritten as

$$b \doteq \beta + (X^T X)^{-1} \{[(x^T y) - (X^T Y)] - (x^T x) - (X^T X)]\beta\}.$$

Finally, observing that $(X^T X)\beta = (X^T Y)$,

$$b \doteq \beta + (X^T X)^{-1} [(x^T y) - (x^T x)\beta]. \qquad \text{(H.5)}$$

To exploit the result in H.5, in order to approximate the sampling variance of b, define

$$\mathcal{Z}(k) = (X^T X)^{-1} [(x^T y)_k - (x^T x)_k \beta], \qquad \text{(H.6)}$$

where

$$(x^T y)_k = X^T(k)\ Y(k),$$

and

$$(x^T x)_k = X^T(k)\ X(k).$$

The corresponding Horvitz-Thompson estimator is

$$\begin{aligned} \hat{\mathcal{Z}} &= \sum_{k \in S} \mathcal{Z}(k)/\pi(k) \\ &= (X^T X)^{-1} [(x^T y) - (x^T x)\beta]. \end{aligned} \qquad \text{(H.7)}$$

Combining H.5 and H.7, it may be observed that

$$\hat{\mathcal{Z}} \doteq (b - \beta). \qquad \text{(H.8)}$$

The result in H.8 leads one to the following approximation for the generalized mean-squared-error of b, the vector of p + 1 estimated regression coefficients:

$$\begin{aligned} \text{GMSE}\{b\} &= E_S\{(b-\beta)(b-\beta)^T\} \\ &\doteq E_S\{\hat{\mathcal{Z}}\ \hat{\mathcal{Z}}^T\} \\ &= \text{VAR}\{\hat{Z}\}, \end{aligned}$$

since $E_S\{\hat{\mathcal{Z}}\} = 0$, the (p+1) x 1 null vector.

If $\mathrm{VAR}_D(\hat{T})$ is the sampling variance formula for an estimated total $\hat{T}$ from a particular sampling design (D), then the generalized mean-squared-error for a vector of (p+1) regression coefficients b estimated from D is approximately

$$\mathrm{GMSE}\{b\} \doteq \mathrm{VAR}_D\{\hat{\mathcal{Z}}\}, \qquad \text{(H.9)}$$

where $\hat{\mathcal{Z}}$ is the linearized statistic

$$\hat{\mathcal{Z}} = (X^TX)^{-1} \sum_{k \varepsilon S} [(x^Ty)_k - (x^Tx)_k \beta] / \pi(k).$$

In the following section, equation H.9 will be exploited to produce the 'Taylor Series' variance estimator or, more precisely, the generalized mean-squared-error estimator for b.

4. Taylor Series Variance Estimator

Recalling the Taylor series approximation for GMSE{b} developed in the previous section, it is clear that if $\mathrm{VAR}_D(\hat{T})$ represents an appropriate variance estimator for the sample total $\hat{T}$ from design D, then $\mathrm{VAR}_D(\hat{\mathcal{Z}})$ is the associated estimator for GMSE{b}. Since the linearized variate value $\mathcal{Z}(k)$ in H.6 is a function of the unknown population quantities $(X^TX)^{-1}$ and β, one is obliged to impose another level of approximation at this point. Instead of $\mathcal{Z}(k)$, one may use

$$z(k) = (x^Tx)^{-1} [(x^Ty)_k - (x^Tx)_k b], \qquad \text{(H.10)}$$

substituting the sample estimates for the unknown population parameters. It is interesting to note at this point that H.10 is a matrix analogue of the 'Taylorized' variate used to approximate the variance of the ratio $\hat{R} = (\hat{Y}/\hat{X})$. Expressing this ratio as $\hat{R} = (\hat{X})^{-1}(\hat{Y})$ and making the associations $(\hat{X})^{-1} \Leftrightarrow (x^Tx)^{-1}$ and $(\hat{Y}) \Leftrightarrow (x^Ty)$, the relationship between H.10 and the familiar

$$\begin{aligned} z_{\hat{R}}(k) &= [Y(k) - \hat{R}\, X\,(k)] / \hat{X} \\ &= (\hat{X})^{-1} [Y(k) - X(k)\, \hat{R}] \end{aligned}$$

is obvious.

To illustrate the method, consider a stratified simple random cluster sample with h=1(1)H strata, and n(h) clusters selected from N(h) without replacement. If y(hik) is the variate value associated with the k-th unit [k=1(1) M(hi)] in cluster-i of stratum-h and X(hik) is the corresponding 1 x (p+1) row vector of regressors, the expanded cluster totals

$$(x^T y)_{hi} = N(h) \sum_{h=1}^{M(hi)} X^T(hik)Y(hik)/n(h),$$

and

$$(x^T x)_{hi} = N(h) \sum_{k=1}^{M(hi)} X^T(hik)X(hik)/n(h),$$

may be used to form

$$\tilde{z}(hi) = [(x^T y)_{hi} - (x^T x)_{hi}\, b],$$

where

$$b = (x^T x)^{-1}\, (x^T y),$$

and

$$(x^T x) = \sum_{h=1}^{H} \sum_{i-1}^{n(h)} (x^T x)_{hi}, \text{ and}$$

$$(x^T y) = \sum_{h=1}^{H} \sum_{i=1}^{n(h)} (x^T y)_{hi}.$$

Then, GMSE{b} may be calculated as

$$\text{GMSE}\{b\} = (x^T x)^{-1} \{ \sum_{h=1}^{H} \{1 - f(h)\}\, n(h)\, s^2_{\tilde{z}}(h)\}\, (x^T x)^{-1},$$

where

$$f(h) = n(h)/N(h)$$

and

$$s^2_{\tilde{z}}(h) = \sum_{i=1}^{n(h)} [\tilde{z}(hi) - \tilde{z}(h.)][\tilde{z}(hi) - \tilde{z}(h.)]^T/[n(h)-1],$$

with $\tilde{z}(h.) = \sum_{i=1}^{n(h)} \tilde{z}(hi)/n(h).$

5. Statistical Inference

Researchers are often interested in testing hypotheses about relationships among population regression coefficients. While there is no rigorous solution to the general linear hypothesis problem in a finite population context, a heuristic approach is suggested which relies on the central limiting tendency of estimated coefficient vectors b to have approximately the multivariate normal sampling distribution with mean β and variance-covariance matrix Var_D as specified in H.9. To the extent that this approximation for the sampling distribution of b holds, one can justify the following approach for testing

$$H_o: C^T\beta = \delta \text{ versus } H_A: C^T\beta \neq \delta;$$

form the test statistic

$$T_c^2 = (C^Tb - \delta)^T[C^T \mathrm{var}_D(\hat{z})\ C]^{-1}(C^Tb - \delta), \qquad \text{(H.11)}$$

and reject H_o if T_c^2 exceeds the upper α percentage point of the Chi-square distribution with c = rank (C) degrees of freedom. this test is the multivariate analogue of the common large sample normal theory test.

When the degrees of freedom (df) associated with the estimated variance-covariance matrix $\mathrm{var}_D(z)$ drops below 60, H.11 may be viewed as the multivariate analogue of Student's t; namely, Hotelling's T^2 statistic. The F-transformed version of Hotelling's T^2 is expressed as

$$F = \{\frac{df + 1 - c}{(df)c}\} \quad T_c^2,$$

where df is the degrees of freedom associated with $\mathrm{var}_D(\hat{z})$. For the example in the previous subsection a recommended approximation is $df \doteq n(+)-H$, where n(+) is the total number of clusters in the sample and H is the number of strata. The transformed statistic F is compared to the upper α percentage point of Fisher's F distribution with c and (df + 1 - c) degrees of freedom.

IV. TABULAR SUMMARIES OF ANALYSES

The comparative/descriptive analyses (and results) are summarized in tabular form in this section. The tables, which constitute the remainder of this appendix, have been annotated sufficiently to be interpreted without reference to textual material. Certain variables were trimmed or otherwise transformed prior to analysis; where such transformations were performed, the nature of the transformation is indicated in a footnote to the table.

Table H.1

Demographic Characteristics of the Three Major Upward Bound Participation Pattern Groups

Variable[a]	Classification	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
		Typical	Atypical	Nonparticipant	
Sex[d]	Male	.445	.403	.535	(1) NS
	Female	.555	.597	.465	(2) p < .05
Age Within Grade[d]	Not Over Age In Grade	.900	.871	.889	(1) NS (2) NS
	Over Age In Grade	.100	.129	.111	
Poverty Status[d]	Poverty Level	.757	.708	.354	(1) p < .05
	Not Poverty Level	.243	.292	.646	(2) p < .01
Academic Risk Status[d]	Risk	.427	.449	.480	(1) NS
	Not Risk	.573	.551	.520	(2) NS
Race	Black	.707	.561	.295	(1) p < .01 (2) p < .01
	White	.130	.249	.580	(1) p < .01 (2) p < .01
	Other	.163	.190	.125	(1) NS (2) NS
Grade Cohort[e]	10th Grade	.132	.186	.379	(1) p < .01 (2) p < .01
	11th Grade	.366	.430	.325	(1) p < .05 (2) NS
	12th Grade	.502	.384	.296	(1) p < .01 (2) p < .01
Number of Cases		1,357	768	1,230	
Weight Total		87,196	56,792	1,284,571	

NOTE: Cell entries are weighted column proportions within major variable categories, based on weights adjusted for indeterminacy of the variables considered and smoothed for nonparticipant crossovers.

[a] These variables determined during base year study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Unless otherwise indicated, two a priori contrasts were formed from the column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Only one set of contrasts is reported for this variable, since the contrasts for each of the two classifications of the variable are completely redundant.

[e] Represents grade level during academic year 1973-74.

Table H.2

Educational Aspiration Level
As a Function of Upward Bound Participation Pattern

Level of Aspiration	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
High School Only	(P = .016) $\tilde{P}$ = .016	(P = .059) $\tilde{P}$ = .033	(P = .113) $\tilde{P}$ = .062	(1) NS (2) $p < .05$
Less Than Two Years of Vocational, Trade, or Business School	(P = .041) $\tilde{P}$ = .041	(P = .054) $\tilde{P}$ = .050	(P = .088) $\tilde{P}$ = .086	(1) NS (2) $p < .05$
Two Years or More of Vocational, Trade, or Business School	(P = .056) $\tilde{P}$ = .056	(P = .126) $\tilde{P}$ = .127	(P = .105) $\tilde{P}$ = .102	(1) $p < .01$ (2) $p < .05$
Less Than Two Years Of College	(P = .020) $\tilde{P}$ = .020	(P = .027) $\tilde{P}$ = .029	(P = .027) $\tilde{P}$ = .034	(1) NS (2) NS
Two or More Years Of College	(P = .061) $\tilde{P}$ = .061	(P = .105) $\tilde{P}$ = .102	(P = .076) $\tilde{P}$ = .079	(1) $p < .05$ (2) NS
Four- or Five-Year College Degree	(P = .258) $\tilde{P}$ = .258	(P = .266) $\tilde{P}$ = .275	(P = .245) $\tilde{P}$ = .261	(1) NS (2) NS
Masters Degree or Equivalent	(P = .293) $\tilde{P}$ = .293	(P = .191) $\tilde{P}$ = .191	(P = .196) $\tilde{P}$ = .188	(1) $p < .01$ (2) $p < .01$
Ph.D., M.D., or Equivalent	(P = .255) $\tilde{P}$ = .255	(P = .172) $\tilde{P}$ = .193	(P = .152) $\tilde{P}$ = .188	(1) $p < .01$ (2) $p < .05$
Number of Cases	1,202	688	1,102	
Weight Total	87,100	56,792	1,284,667	

NOTE: Two entries are provided in each cell: (1) raw weighted within column proportions, P (in parentheses), and (2) adjusted weighted within column proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted within column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.3

Rates of Aspiring to a Four-Year Degree or More As a Function of Upward Bound Participation Pattern

Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
Typical	Atypical	Nonparticipant	
(P = .805)	(P = .630)	(P = .592)	(1) $p < .01$
$\tilde{P}$ = .805	$\tilde{P}$ = .660	$\tilde{P}$ = .637	(2) $p < .01$
N = 1,202	N = 688	N = 1,102	
WN = 87,100	WN = 56,792	WN = 1,284,667	

NOTE: Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two a priori contrasts were formed from the adjusted proportions: (1) column one versus column two, and (2) column one versus column three.

Table H.4

Educational Expectation Level
As a Function of Upward Bound Participation Pattern

	Upward Bound Participation Pattern[a]			Significance Level
Level of Expectation	Typical	Atypical	Nonparticipant	Of Contrasts[b]
High School Only	(P = .040) $\bar{P}$ = .040	(P = .135) $\bar{P}$ = .118	(P = .170) $\bar{P}$ = .122	(1) $p < .01$ (2) $p < .01$
Less Than Two Years of Vocational, Trade, or Business School	(P = .039) $\bar{P}$ = .039	(P = .079) $\bar{P}$ = .071	(P = .091) $\bar{P}$ = .097	(1) NS (2) $p < .01$
Two Years or More of Vocational, Trade, or Business School	(P = .071) $\bar{P}$ = .071	(P = .099) $\bar{P}$ = .093	(P = .091) $\bar{P}$ = .071	(1) NS (2) NS
Less Than Two Years Of College	(P = .035) $\bar{P}$ = .035	(P = .047) $\bar{P}$ = .045	(P = .071) $\bar{P}$ = .079	(1) NS (2) $p < .01$
Two or More Years Of College	(P = .096) $\bar{P}$ = .096	(P = .098) $\bar{P}$ = .091	(P = .109) $\bar{P}$ = .102	(1) NS (2) NS
Four- or Five-Year College Degree	(P = .342) $\bar{P}$ = .342	(P = .312) $\bar{P}$ = .326	(P = .257) $\bar{P}$ = .279	(1) NS (2) NS
Masters Degree or Equivalent	(P = .268) $\bar{P}$ = .268	(P = .161) $\bar{P}$ = .166	(P = .155) $\bar{P}$ = .156	(1) $p < .01$ (2) $p < .01$
Ph.D., M.D., or Equivalent	(P = .108) $\bar{P}$ = .108	(P = .070) $\bar{P}$ = .090	(P = .057) $\bar{P}$ = .093	(1) NS (2) NS
Number of Cases	1,096	624	962	
Weight Total	87,005	56,792	1,284,763	

NOTE: Two entries are provided in each cell: (1) raw weighted within column proportions, P (in parentheses), and (2) adjusted weighted within column proportions, $\bar{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted within column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.5

Rates of Expecting a Four-Year Degree or More As a Function of Upward Bound Participation Pattern

Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
Typical	Atypical	Nonparticipant	
($\underset{\sim}{P}$ = .718) $\tilde{P}$ = .718 N = 1,096 WN = 87,005	($\underset{\sim}{P}$ = .543) $\tilde{P}$ = .583 N = 624 WN = 56,792	($\underset{\sim}{P}$ = .469) $\tilde{P}$ = .529 N = 962 WN = 1,284,763	(1) $p < .01$ (2) $p < .01$

NOTE: Four entries are provided in each cell: (1) raw weighted proportions, $\underset{\sim}{P}$ (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted proportions: (1) column one versus column two, and (2) column one versus column three.

Table H.6

High School Completion Rates as a Function of Upward Bound Participation Pattern and Cohort

Cohort (Grade Level In Fall 1973)	Upward Bound Participation Pattern[a]				
	10th, 11th, and 12th Grade	11th and 12th Grade	12th Grade Only Or 10th and 12th Grade	10th Grade Only, 11th Grade Only, Or 10th and 11th Grade	No Participation
10th Grade[b]	(P = .987) $\bar{P}$ = .987 N = 161 WN = 11,500			(P = .905) $\bar{P}$ = .935 N = 129 WN = 10,583	(P = .927) $\bar{P}$ = .934 N = 375 WN = 486,689
11th Grade[c]	(P = .989) $\bar{P}$ = .989 N = 287 WN = 18,299	(P = .983) $\bar{P}$ = .985 N = 214 WN = 13,650		(P = .953) $\bar{P}$ = .955 N = 320 WN = 24,381	(P = .950) $\bar{P}$ = .957 N = 405 WN = 417,151
12th Grade[d]	[illegible] .997) [illegible] .997 N = 355 WN = 22,688	(P = 1.000) $\bar{P}$ = 1.000 N = 338 WN = 21,060	(P = .991) $\bar{P}$ = .987 N = 81 WN = 5,361	(P = .978) $\bar{P}$ = .972 N = 233 WN = 16,467	(P = .980) $\bar{P}$ = .960 N = 442 WN = 380,731

NOTE: Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses); (2) adjusted weighted proportions, $\bar{P}$ (adjusted within row for sex, race, poverty status, academic risk status, and over age in grade characteristics of the leftmost UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Three cells in the crossing of participation pattern and cohort have been eliminated. Two such cells represent impossible situations for the original sample of UB participants (but were possible for the crossover group). The remaining cell (10th and 12th grade participation for 10th grade cohort members) represented a very atypical pattern. Individuals falling in the two eliminated cells in column three were relocated into the cells immediately to the right; those falling in the eliminated cell in column two were relocated into the cell immediately to the left.

[b] Two *a priori* contrasts were formed from the adjusted proportions of this row: (1) column one versus column four, and (2) column one versus column five. Neither contrast was statistically significant at the .05 level.

[c] Three *a priori* contrasts were formed from the adjusted proportions of this row: (1) column one versus column two, (2) column one versus column five, and (3) columns one and two versus column four. The final contrast was statistically significant at the .05 level.

[d] Four *a priori* contrasts were formed from the adjusted proportions of this row: (1) column one versus column two, (2) column one versus column five, (3) column three versus column four, and (4) columns one and two versus columns three and four. The second and fourth contrasts were statistically significant at the .05 level.

Table H.7

Postsecondary Entry Rates as a Function of Upward Bound Participation Pattern and Cohort

Cohort (Grade Level In Fall 1973)	Upward Bound Participation Pattern[a]				
	10th, 11th, and 12th Grade	11th and 12th Grade	12th Grade Only Or 10th and 12th Grade	10th Grade Only, 11th Grade Only, Or 10th and 11th Grade	No Participation
10th Grade[b]	(P = .859) $\bar{P}$ = .859 N = 150 WN = 11,347			(P = .676) $\bar{P}$ = .769 N = 112 WN = 9,575	(P = .649) $\bar{P}$ = .739 N = 341 WN = 451,110
11th Grade[c]	(P = .935) $\bar{P}$ = .935 N = 279 WN = 18,061	(P = .901) $\bar{P}$ = .904 N = 206 WN = 13,444		(P = .718) $\bar{P}$ = .711 N = 296 WN = 23,238	(P = .636) $\bar{P}$ = .638 N = 376 WN = 396,193
12th Grade[d]	(P = .896) $\bar{P}$ = .896 N = 348 WN = 22,509	(P = .918) $\bar{P}$ = .934 N = 334 WN = 21,163	(P = .872) $\bar{P}$ = .920 N = 76 WN = 5,195	(P = .747) $\bar{P}$ = .791 N = 219 WN = 16,218	(P = .631) $\bar{P}$ = .724 N = 426 WN = 373,027

NOTE: These analyses were restricted to high school graduates. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses); (2) adjusted weighted proportions, $\bar{P}$ (adjusted within row for sex, race, poverty status, academic risk status, and over age in grade characteristics of the leftmost UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Three cells in the crossing of participation pattern and cohort have been eliminated. Two such cells represent impossible situations for the original sample of UB participants (but were possible for the crossover group). The remaining cell (10th and 12th grade participation for 10th grade cohort members) represented a very atypical pattern. Individuals falling in the two eliminated cells in column three were relocated into the cells immediately to the right; those falling in the eliminated cell in column two were relocated into the cell immediately to the left.

[b] Two *a priori* contrasts were formed from the adjusted proportions of this row: (1) column one versus column four, and (2) column one versus column five. Neither contrast was statistically significant at the .05 level.

[c] Three *a priori* contrasts were formed from the adjusted proportions of this row: (1) column one versus column two, (2) column one versus column five, and (3) columns one and two versus column four. The latter two contrasts were statistically significant at the .05 level.

[d] Four *a priori* contrasts were formed from the adjusted proportions of this row: (1) column one versus column two, (2) column one versus column five, (3) column three versus column four, and (4) columns one and two versus columns three and four. Only the second contrast was statistically significant at the .05 level.

Table H.8

Rates of Lag Entry into Postsecondary Institutions as a Function of Upward Bound Participation Pattern and Cohort

Cohort (Grade Level In Fall 1973)	Upward Bound Participation Pattern[a]				
	10th, 11th, and 12th Grade	11th and 12th Grade	12th Grade Only Or 10th and 12th Grade	10th Grade Only, 11th Grade Only, Or 10th and 11th Grade	No Participation
10th Grade[b]	(P = .130) $\tilde{P}$ = .130 N = 129 WN = 9,926			(P = .348) $\tilde{P}$ = .[illegible]53 N = 72 WN = 6,571	(P = .258) $\tilde{P}$ = .338 N = 203 WN = 297,814
11th Grade[c]	(P = .153) $\tilde{P}$ = .153 N = 252 WN = 17,102	(P = .104) $\tilde{P}$ = .105 N = 181 WN = 12,044		(P = .247) $\tilde{P}$ = .249 N = 199 WN = 16,799	(P = .170) $\tilde{P}$ = .180 N = 239 WN = 252,996
12th Grade[d]	(P = .097) $\tilde{P}$ = .097 N = 304 WN = 20,206	(P = .136) $\tilde{P}$ = .128 N = 303 WN = 19,523	(P = .122) $\tilde{P}$ = .103 N = 68 WN = 4,842	(P = .254) $\tilde{P}$ = .244 N = 166 WN = 12,246	(P = .261) $\tilde{P}$ = .316 N = 280 WN = 237,453

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses); (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for sex, race, poverty status, academic risk status, and over age in grade characteristics of the leftmost UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Three cells in the crossing of participation pattern and cohort have been eliminated. Two such cells represent impossible situations for the original sample of UB participants (but were possible for the crossover group). The remaining cell (10th and 12th grade participation for 10th grade cohort members) represented a very atypical pattern. Individuals falling in the two eliminated cells in column three were relocated into the cells immediately to the right; those falling in the eliminated cell in column two were relocated into the cell immediately to the left.

[b] Two *a priori* contrasts were formed from the adjusted proportions of this row: (1) column one versus column four, and (2) column one versus column five. Both contrasts were statistically significant at the .05 level.

[c] Three *a priori* contrasts were formed from the adjusted proportions of this row: (1) column one versus column two, (2) column one versus column five, and (3) columns one and two versus column four. Only the last of these contrasts was statistically significant at the .05 level.

[d] Four *a priori* contrasts were formed from the adjusted proportions of this row: (1) column one versus column two, (2) column one versus column five, (3) column three versus column four, and (4) columns one and two versus columns three and four. All but the first of these contrasts were statistically significant at the .05 level.

Table H.9

Educational Progress Relative to Goals As a Function of Upward Bound Participation Pattern and Cohort

Cohort (Grade Level in Fall 1973)[b]	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts
	Typical	Atypical	Nonparticipant	
10th Grade	($\underline{M}$ = 40.1%) $\tilde{M}$ = 40.1% N = 129 WN = 11,157	($\underline{M}$ = 23.3%) $\tilde{M}$ = 27.6% N = 103 WN = 9,930	($\underline{M}$ = 30.0%) $\tilde{M}$ = 32.6% N = 292 WN = 430,855	(1) $p < .05$ (2) NS
11th Grade	($\underline{M}$ = 51.8%) $\tilde{M}$ = 51.8% N = 428 WN = 31,320	($\underline{M}$ = 37.7%) $\tilde{M}$ = 36.2% N = 263 WN = 22,927	($\underline{M}$ = 39.2%) $\tilde{M}$ = 35.4% N = 324 WN = 369,861	(1) $p < .01$ (2) $p < .01$
12th Grade	($\underline{M}$ = 52.0%) $\tilde{M}$ = 52.0% N = 601 WN = 43,421	($\underline{M}$ = 44.2%) $\tilde{M}$ = 44.8% N = 257 WN = 20,815	($\underline{M}$ = 37.8%) $\tilde{M}$ = 38.2% N = 349 WN = 349,105	(1) $p < .05$ (2) $p < .01$

NOTE: These analyses are restricted to those aspiring to some form of postsecondary education. The variable reported is actual progress expressed as a percentage of progress necessary to achieve reported educational goal (see Appendix E). Four entries are provided in each cell: (1) raw weighted means, $\underline{M}$ (in parentheses), (2) adjusted weighted means, $\tilde{M}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted means within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.10

Extent to Which Poor Grades Were Reported as an Educational Problem Area As a Function of Upward Bound Participation Pattern

Extent of Problem	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Did Not Experience	(P = .352) P = .352	(P = .461) P = .446	(P = .478) P = .415	(1) p < .01 (2) NS
Small Problem	(P = .427) P = .427	(P = .348) P = .373	(P = .396) P = .454	(1) NS (2) NS
Moderate Problem	(P = .159) P = .159	(P = .135) P = .129	(P = .083) P = .083	(1) NS (2) p < .01
Large Problem	(P = .062) P = .062	(P = .056) P = .052	(P = .044) P = .048	(1) NS (2) NS
Mean Value[c]	(M = 1.93) M = 1.93	(M = 1.78) M = 1.79	(M = 1.69) M = 1.76	(1) p < .01 (2) p < .01
Number of Cases	1,221	710	1,144	
Weight Total	87,196	56,792	1,284,571	

NOTE: Two entries are provided in each cell: (1) raw weighted column proportions or means, P or M (in parentheses), and (2) adjusted weighted column proportions or means, P or M (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted column proportions or means within each row: (1) column one versus column two, and (2) column one versus column three.

[c] Averages were taken for a four-valued scaling (from 1 to 4 in the order given) of extent to which problem was experienced.

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Table H.11

Extent to Which Poor High School Preparation Was Reported as an Educational Problem Area As a Function of Upward Bound Participation Pattern

Extent of Problem	Upward Bound Participation Pattern[a] Typical	Atypical	Nonparticipant	Significance Level Of Contrasts[b]
Did Not Experience	(P = .433) P = .433	(P = .459) P = .457	(P = .526) P = .517	(1) NS (2) p < .05
Small Problem	(P = .271) P = .271	(P = .287) P = .286	(P = .285) P = .282	(1) NS (2) NS
Moderate Problem	(P = .144) P = .144	(P = .130) P = .137	(P = .117) P = .124	(1) NS (2) NS
Large Problem	(P = .152) P = .152	(P = .124) P = .120	(P = .071) P = .077	(1) NS (2) p < .01
Mean Value[c]	(M = 2.02) M = 2.02	(M = 1.92) M = 1.92	(M = 1.73) M = 1.76	(1) NS (2) p < .01
Number of Cases	1,221	710	1,144	
Weight Total	87,196	56,792	1,284,571	

NOTE: Two entries are provided in each cell: (1) raw weighted column proportions or means, P or M (in parentheses), and (2) adjusted weighted column proportions or means, P or M (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted column proportions or means within each row: (1) column one versus column two, and (2) column one versus column three.

[c] Averages were taken for a four-valued scaling (from 1 to 4 in the order given) of extent to which problem was experienced.

Table H.12

Extent to Which Lack of Personal or Family Finances Was Reported as an Educational Problem Area As a Function of Upward Bound Participation Pattern

Extent of Problem	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Did Not Experience	($\underset{\sim}{P}$ = .245) P = .245	($\underset{\sim}{P}$ = .301) P = .270	($\underset{\sim}{P}$ = .481) P = .358	(1) NS (2) $p < .05$
Small Problem	($\underset{\sim}{P}$ = .205) P = .205	($\underset{\sim}{P}$ = .232) P = .243	($\underset{\sim}{P}$ = .214) P = .231	(1) NS (2) NS
Moderate Problem	($\underset{\sim}{P}$ = .232) P = .232	($\underset{\sim}{P}$ = .166) P = .172	($\underset{\sim}{P}$ = .166) P = .192	(1) $p < .01$ (2) NS
Large Problem	($\underset{\sim}{P}$ = .319) P = .319	($\underset{\sim}{P}$ = .301) P = .315	($\underset{\sim}{P}$ = .138) P = .219	(1) NS (2) $p < .01$
Mean Value[c]	($\underset{\sim}{M}$ = 2.62) M = 2.62	($\underset{\sim}{M}$ = 2.47) M = 2.53	($\underset{\sim}{M}$ = 1.96) M = 2.27	(1) NS (2) $p < .01$
Number of Cases	1,221	710	1,144	
Weight Total	87,196	56,792	1,284,571	

NOTE: Two entries are provided in each cell: (1) raw weighted column proportions or means, P or M (in parentheses), and (2) adjusted weighted column proportions or means, P or M (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted column proportions or means within each row: (1) column one versus column two, and (2) column one versus column three.

[c] Averages were taken for a four-valued scaling (from 1 to 4 in the order given) of extent to which problem was experienced.

Table H.13

Extent to Which Inadequate Financial Aid Was Reported as an Educational Problem Area As a Function of Upward Bound Participation Pattern

Extent of Problem	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Did Not Experience	(P = .411) $\tilde{P}$ = .411	(P = .444) $\tilde{P}$ = .420	(P = .579) $\tilde{P}$ = .475	(1) NS (2) NS
Small Problem	(P = .247) $\tilde{P}$ = .247	(P = .234) $\tilde{P}$ = .245	(P = .205) $\tilde{P}$ = .229	(1) NS (2) NS
Moderate Problem	(P = .192) $\tilde{P}$ = .192	(P = .149) $\tilde{P}$ = .156	(P = .128) $\tilde{P}$ = .165	(1) $p < .01$ (2) NS
Large Problem	(P = .151) $\tilde{P}$ = .151	(P = .173) $\tilde{P}$ = .180	(P = .088) $\tilde{P}$ = .131	(1) NS (2) NS
Mean Value[c]	(M = 2.08) $\tilde{M}$ = 2.08	(M = 2.05) $\tilde{M}$ = 2.10	(M = 1.73) $\tilde{M}$ = 1.95	(1) NS (2) NS
Number of Cases	1,221	710	1,143	
Weight Total	87,196	56,792	1,284,571	

NOTE: Two entries are provided in each cell: (1) raw weighted column proportions or means, P or M (in parentheses), and (2) adjusted weighted column proportions or means, $\tilde{P}$ or $\tilde{M}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted column proportions or means within each row: (1) column one versus column two, and (2) column one versus column three.

[c] Averages were taken for a four-valued scaling (from 1 to 4 in the order given) of extent to which problem was experienced.

Table H.14

Extent to Which Unavailability of Desired Program Was Reported as an Educational Problem Area As a Function of Upward Bound Participation Pattern

Extent of Problem	Upward Bound Participation Pattern[a] Typical	Atypical	Nonparticipant	Significance Level Of Contrasts[b]
Did Not Experience	(P = .700) P = .700	(P = .702) P = .686	(P = .717) P = .673	(1) NS (2) NS
Small Problem	(P = .151) P = .151	(P = .176) P = .178	(P = .154) P = .155	(1) NS (2) NS
Moderate Problem	(P = .071) P = .071	(P = .058) P = .061	(P = .066) P = .069	(1) NS (2) NS
Large Problem	(P = .077) P = .077	(P = .064) P = .075	(P = .063) P = .103	(1) NS (2) NS
Mean Value[c]	(M = 1.52) M = 1.52	(M = 1.48) M = 1.52	(M = 1.48) M = 1.60	(1) NS (2) NS
Number of Cases	1,221	710	1,142	
Weight Total	87,196	56,792	1,284,571	

NOTE: Two entries are provided in each cell: (1) raw weighted column proportions or means, P or M (in parentheses), and (2) adjusted weighted column proportions or means, P or M (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted column proportions or means within each row: (1) column one versus column two, and (2) column one versus column three.

[c] Averages were taken for a four-valued scaling (from 1 to 4 in the order given) of extent to which problem was experienced.

Table H.15

Extent to Which Family Responsibilities Were Reported as an Educational Problem Area As a Function of Upward Bound Participation Pattern

Extent of Problem	Upward Bound Participation Pattern[a] Typical	Atypical	Nonparticipant	Significance Level Of Contrasts[b]
Did Not Experience	(P = .525) P = .525	(P = .563) P = .542	(P = .633) P = .523	(1) NS (2) NS
Small Problem	(P = .232) P = .232	(P = .206) P = .209	(P = .203) P = .220	(1) NS (2) NS
Moderate Problem	(P = .124) P = .124	(P = .109) P = .119	(P = .079) P = .133	(1) NS (2) NS
Large Problem	(P = .119) P = .119	(P = .122) P = .129	(P = .084) P = .125	(1) NS (2) NS
Mean Value[c]	(M = 1.84) M = 1.84	(M = 1.79) M = 1.84	(M = 1.61) M = 1.86	(1) NS (2) NS
Number of Cases	1,221	710	1,144	
Weight Total	87,196	56,792	1,284,571	

NOTE: Two entries are provided in each cell: (1) raw weighted column proportions or means, P or M (in parentheses), and (2) adjusted weighted column proportions or means, P or M (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted column proportions or means within each row: (1) column one versus column two, and (2) column one versus column three.

[c] Averages were taken for a four-valued scaling (from 1 to 4 in the order given) of extent to which problem was experienced.

Table H.16

Extent to Which Lack of Information on Desired Program Was Reported as an Educational Problem Area As a Function of Upward Bound Participation Pattern

Extent of Problem	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Did Not Experience	(P = .592) P = .592	(P = .638) P = .601	(P = .654) P = .551	(1) NS (2) NS
Small Problem	(P = .215) P = .215	(P = .198) P = .208	(P = .185) P = .213	(1) NS (2) NS
Moderate Problem	(P = .107) P = .107	(P = .087) P = .102	(P = .096) P = .135	(1) NS (2) NS
Large Problem	(P = .086) P = .086	(P = .077) P = .090	(P = .065) P = .101	(1) NS (2) NS
Mean Value[c]	(M = 1.69) M = 1.69	(M = 1.60) M = 1.68	(M = 1.57) M = 1.79	(1) NS (2) NS
Number of Cases	1,221	710	1,143	
Weight Total	87,196	56,792	1,284,571	

NOTE: Two entries are provided in each cell: (1) raw weighted column proportions or means, P or M (in parentheses), and (2) adjusted weighted column proportions or means, P or M (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted column proportions or means within each row: (1) column one versus column two, and (2) column one versus column three.

[c] Averages were taken for a four-valued scaling (from 1 to 4 in the order given) of extent to which problem was experienced.

Table H.17

Extent To Which Lack of Information on Educational Requirements for Desired Career Was Reported as an Educational Problem Area As a Function of Upward Bound Participation Pattern

Extent of Problem	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Did Not Experience	($\underset{\sim}{P}$ = .573) P = .573	($\underset{\sim}{P}$ = .572) P = .542	($\underset{\sim}{P}$ = .617) P = .539	(1) NS (2) NS
Small Problem	($\underset{\sim}{P}$ = .218) P = .218	($\underset{\sim}{P}$ = .239) P = .246	($\underset{\sim}{P}$ = .199) P = .226	(1) NS (2) NS
Moderate Problem	($\underset{\sim}{P}$ = .112) P = .112	($\underset{\sim}{P}$ = .084) P = .099	($\underset{\sim}{P}$ = .083) P = .115	(1) NS (2) NS
Large Problem	($\underset{\sim}{P}$ = .097) P = .097	($\underset{\sim}{P}$ = .105) P = .113	($\underset{\sim}{P}$ = .101) P = .119	(1) NS (2) NS
Mean Value[c]	($\underset{\sim}{M}$ = 1.32) M = 1.32	($\underset{\sim}{M}$ = 1.72) M = 1.78	($\underset{\sim}{M}$ = 1.67) M = 1.81	(1) NS (2) NS
Number of Cases	1,221	710	1,143	
Weight Total	87,196	56,792	1,284,571	

NOTE: Two entries are provided in each cell: (1) raw weighted column proportions or means, $\underset{\sim}{P}$ or $\underset{\sim}{M}$ (in parentheses), and (2) adjusted weighted column proportions or means, P or M (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two a priori contrasts were formed from the adjusted column proportions or means within each row: (1) column one versus column two, and (2) column one versus column three.

[c] Averages were taken for a four-valued scaling (from 1 to 4 in the order given) of extent to which problem was experienced.

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Table H.18

Current Employment Status
As a Function of Upward Bound Participation Pattern
And Current Enrollment Status

Current Enrollment Status	Current Employment Status	Upward Bound Participation Pattern[a/]			Significance Level Of Contrasts[b/]
		Typical	Atypical	Nonparticipant	
Not Enrolled	Not Working	($\underset{\sim}{P}$ = .271) $\tilde{P}$ = .271	($\underset{\sim}{P}$ = .278) $\tilde{P}$ = .256	($\underset{\sim}{P}$ = .189) $\tilde{P}$ = .180	(1) NS (2) $p < .05$
	Working Part-Time	($\underset{\sim}{P}$ = .119) $\tilde{P}$ = .119	($\underset{\sim}{P}$ = .139) $\tilde{P}$ = .145	($\underset{\sim}{P}$ = .105) $\tilde{P}$ = .128	(1) NS (2) NS
	Working Full-Time	($\underset{\sim}{P}$ = .610) $\tilde{P}$ = .610	($\underset{\sim}{P}$ = .583) $\tilde{P}$ = .599	($\underset{\sim}{P}$ = .706) $\tilde{P}$ = .692	(1) NS (2) NS
	Number of Cases	570	249	343	
	Weight Total	43,680	29,002	590,219	
Enrolled	Not Working	($\underset{\sim}{P}$ = .454) $\tilde{P}$ = .454	($\underset{\sim}{P}$ = .475) $\tilde{P}$ = .495	($\underset{\sim}{P}$ = .432) $\tilde{P}$ = .520	(1) NS (2) NS
	Working Part-Time	($\underset{\sim}{P}$ = .292) $\tilde{P}$ = .292	($\underset{\sim}{P}$ = .203) $\tilde{P}$ = .163	($\underset{\sim}{P}$ = .304) $\tilde{P}$ = .218	(1) $p < .01$ (2) NS
	Working Full-Time	($\underset{\sim}{P}$ = .254) $\tilde{P}$ = .254	($\underset{\sim}{P}$ = .323) $\tilde{P}$ = .342	($\underset{\sim}{P}$ = .264) $\tilde{P}$ = .262	(1) $p < .05$ (2) NS
	Number of Cases	541	210	343	
	Weight Total	43,362	27,790	694,507	

NOTE: Two entries are provided in each cell: (1) raw weighted column proportions within major enrollment-status breakdown, $\underset{\sim}{P}$ (in parentheses), and (2) adjusted weighted column proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a/] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12: the atypical pattern category includes all other patterns of UB participation.

[b/] Two *a priori* contrasts were formed from the adjusted column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

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Table H.19

Average Level of Satisfaction With Life
As a Function of Upward Bound Participation Pattern and Current Educational Status

Current Educational Status	Upward Bound Participation Pattern[a] Typical	Atypical	Nonparticipant	Significance Level Of Contrasts[b]
Did Not Enter Postsecondary Education	(M = 3.13) $\tilde{M}$ = 3.13 N = 98 WN = 7,459	(M = 2.70) $\tilde{M}$ = 2.91 N = 165 WN = 14,705	(M = 3.51) $\tilde{M}$ = 3.22 N = 353 WN = 450,311	(1) NS (2) NS
Entered Postsecondary Education But Did Not Graduate and Not Currently Enrolled	(M = 2.70) $\tilde{M}$ = 2.70 N = 363 WN = 27,983	(M = 3.11) $\tilde{M}$ = 3.06 N = 152 WN = 12,532	(M = 3.44) $\tilde{M}$ = 2.84 N = 202 WN = 227,958	(1) $p < .05$ (2) NS
Entered Postsecondary Education and Graduated Or Currently Enrolled	(M = 3.60) $\tilde{M}$ = 3.60 N = 671 WN = 50,838	(M = 3.50) $\tilde{M}$ = 3.44 N = 283 WN = 26,990	(M = 3.74) $\tilde{M}$ = 3.33 N = 452 WN = 542,304	(1) NS (2) $p < .05$

NOTE: Satisfaction was measured on a five point scale from 1 = very dissatisfied to 5 = very satisfied. Four entries are provided in each cell: (1) raw weighted means, M (in parentheses), (2) adjusted weighted means, $\tilde{M}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.20

Demographic Characteristics of PSE Entrants
From the Three Major Upward Bound Participation Pattern Groups

Variable[a]	Classification	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
		Typical	Atypical	Nonparticipant	
Sex[d]	Male	.430	.384	.508	(1) NS
	Female	.570	.616	.492	(2) NS
Age Within Grade[d]	Not Over Age In Grade	.906	.899	.917	(1) NS (2) NS
	Over Age In Grade	.094	.101	.083	
Poverty Status[d]	Poverty Level	.758	.714	.309	(1) NS
	Not Poverty Level	.242	.286	.691	(2) p < .01
Academic Risk Status[d]	Risk	.409	.390	.375	(1) NS
	Not Risk	.591	.610	.625	(2) NS
Race	Black	.724	.616	.318	(1) p < .01 (2) p < .01
	White	.118	.191	.579	(1) p < .01 (2) p < .01
	Other	.158	.193	.103	(1) NS (2) NS
Grade Cohort[e]	10th Grade	.120	.164	.370	(1) p < .05 (2) p < .01
	11th Grade	.372	.419	.329	(1) NS (2) NS
	12th Grade	.508	.417	.301	(1) p < .05 (2) p < .01
Number of Cases		1,196	515	746	
Weight Total		76,960	38,567	760,281	

NOTE: These analyses were restricted to PSE entrants. Cell entries are weighted column proportions within major variable categories, based on weights adjusted for indeterminacy of the variables considered and smoothed for nonparticipant crossovers.

[a] These variables determined during base year study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Unless otherwise indicated, two a priori contrasts were formed from the column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Only one set of contrasts is reported for this variable, since the contrasts for each of the two classifications of the variable are completely redundant.

[e] Represents grade level during academic year 1973-74.

Table H.21

Student Body Family Income Level of Institution Last Attended As a Function of Upward Bound Participation Pattern

Family Income Level Of Student Body	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Low SES	(P = .578) $\tilde{P}$ = .578	(P = .578) $\tilde{P}$ = .596	(P = .459) $\tilde{P}$ = .580	(1) NS (2) NS
Intermediate SES	(P = .352) $\tilde{P}$ = .352	(P = .364) $\tilde{P}$ = .354	(P = .454) $\tilde{P}$ = .367	(1) NS (2) NS
High SES	(P = .070) $\tilde{P}$ = .070	(P = .058) $\tilde{P}$ = .050	(P = .087) $\tilde{P}$ = .053	(1) NS (2) NS
Number of Cases	1,171	506	736	
Weight Total	76,960	38,567	762,304	

NOTE: These analyses were restricted to PSE entrants. Two entries are provided in each cell: (1) raw weighted column proportions, P (in parentheses), and (2) adjusted weighted column proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.22

Relative Selectivity Level of Institution Last Attended As a Function of Upward Bound Participation Pattern

Relative Selectivity Level	Upward Bound Participation Pattern[a/]			Significance Level Of Contrasts[b/]
	Typical	Atypical	Nonparticipant	
Low Selectivity	(P = .582) $\tilde{P}$ = .582	(P = .638) $\tilde{P}$ = .660	(P = .579) $\tilde{P}$ = .699	(1) NS (2) $p < .05$
Intermediate Selectivity	(P = .239) $\tilde{P}$ = .239	(P = .240) $\tilde{P}$ = .223	(P = .219) $\tilde{P}$ = .149	(1) NS (2) $p < .05$
High Selectivity	(P = .179) $\tilde{P}$ = .179	(P = .123) $\tilde{P}$ = .117	(P = .202) $\tilde{P}$ = .152	(1) $p < .05$ (2) NS
Number of Cases	1,171	506	736	
Weight Total	76,960	38,567	762,304	

NOTE: These analyses were restricted to PSE entrants. Two entries are provided in each cell: (1) raw weighted column proportions, P (in parentheses), and (2) adjusted weighted column proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a/] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b/] Two *a priori* contrasts were formed from the adjusted column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.23

Distribution of Cost of Institution Last Attended As a Function of Upward Bound Participation Pattern

Composite Per-Student Cost of Attending Institution	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Less Than $500	(P = .294) $\tilde{P}$ = .294	(P = .338) $\tilde{P}$ = .318	(P = .404) $\tilde{P}$ = .379	(1) NS (2) NS
$500 - $999	(P = .407) $\tilde{P}$ = .407	(P = .384) $\tilde{P}$ = .402	(P = .420) $\tilde{P}$ = .455	(1) NS (2) NS
$1,000 - $1,999	(P = .140) $\tilde{P}$ = .140	(P = .112) $\tilde{P}$ = .119	(P = .086) $\tilde{P}$ = .098	(1) NS (2) NS
$2,000 - $3,999	(P = .132) $\tilde{P}$ = .132	(P = .145) $\tilde{P}$ = .145	(P = .071) $\tilde{P}$ = .070	(1) NS (2) NS
$4,000 or More	(P = .028) $\tilde{P}$ = .028	(P = .022) $\tilde{P}$ = .016	(P = .020) $\tilde{P}$ = .003	(1) NS (2) $p < .05$
Number of Cases	1,159	487	711	
Weight Total	76,960	38,567	762,304	

NOTE: These analyses were restricted to PSE entrants. Two entries are provided in each cell: (1) raw weighted column proportions, P (in parentheses), and (2) adjusted weighted column proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.24

Size of Institution Last Attended As a Function of Upward Bound Participation Pattern

Undergradate Student Enrollment	Upward Bound Participation Pattern[a/]			Significance Level Of Contrasts[b/]
	Typical	Atypical	Nonparticipant	
Less Than 500	(P = .086) P = .086	(P = .182) P = .187	(P = .156) P = .219	(1) p < .01 (2) p < .01
500 - 2,499	(P = .358) P = .358	(P = .317) P = .309	(P = .220) P = .206	(1) NS (2) p < .01
2,500 - 7,499	(P = .273) P = .273	(P = .241) P = .245	(P = .260) P = .224	(1) NS (2) NS
7,500 - 14,999	(P = .167) P = .167	(P = .153) P = .152	(P = .226) P = .191	(1) NS (2) NS
15,000 or More	(P = .115) P = .115	(P = .107) P = .107	(P = .138) P = .160	(1) NS (2) NS
Number of Cases	1,171	506	736	
Weight Total	76,960	38,567	762,304	

NOTE: These analyses were restricted to PSE entrants. Two entries are provided in each cell: (1) raw weighted column proportions, P (in parentheses), and (2) adjusted weighted column proportions, P (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a/] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b/] Two *a priori* contrasts were formed from the adjusted column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.25

Rates of Attending Institutions With Predominantly or Traditionally Non-White Student Bodies As a Function of Upward Bound Participation

Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
Typical	Atypical	Nonparticipant	
($\underline{P}$ = .297) $\tilde{P}$ = .297 N = 1,171 WN = 76,960	($\underline{P}$ = .170) $\tilde{P}$ = .172 N = 506 WN = 38,567	($\underline{P}$ = .117) $\tilde{P}$ = .179 N = 736 WN = 762,304	(1) $p < .01$ (2) $p < .01$

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.26

Offering and Control Level of Institution Last Attended As a Function of Upward Bound Participation Pattern

Offering/Control Classification	Upward Bound Participation Pattern[a/]			Significance Level Of Contrasts[b/]
	Typical	Atypical	Nonparticipant	
Vocational, Technical, Business, or Proprietary School	(P = .084) $\tilde{P}$ = .084	(P = .181) $\tilde{P}$ = .188	(P = .172) $\tilde{P}$ = .221	(1) $p < .01$ (2) $p < .01$
Public Two-Year College	(P = .181) $\tilde{P}$ = .181	(P = .248) $\tilde{P}$ = .244	(P = .255) $\tilde{P}$ = .267	(1) $p < .05$ (2) NS
Private Two-Year College	(P = .009) $\tilde{P}$ = .009	(P = .024) $\tilde{P}$ = .024	(P = .017) $\tilde{P}$ = .016	(1) NS (2) NS
Public Four-Year College Or University	(P = .460) $\tilde{P}$ = .460	(P = .360) $\tilde{P}$ = .355	(P = .413) $\tilde{P}$ = .357	(1) $p < .01$ (2) $p < .05$
Private Four-Year College Or University	(P = .266) $\tilde{P}$ = .266	(P = .187) $\tilde{P}$ = .190	(P = .143) $\tilde{P}$ = .139	(1) $p < .05$ (2) $p < .01$
Number of Cases	1,171	506	736	
Weight Total	76,960	38,567	762,304	

NOTE: These analyses were restricted to PSE entrants. Two entries are provided in each cell: (1) raw weighted column proportions, P (in parentheses), and (2) adjusted weighted column proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a/] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b/] Two *a priori* contrasts were formed from the adjusted column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.27

Proportion of Two-Year Postsecondary Institution Entrants Subsequently Transferring to Four-Year Institutions As a Function of Upward Bound Participation Pattern

Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
Typical	Atypical	Nonparticipant	
(P = .217) $\tilde{P}$ = .217 N = 434 WN = 28,644	(P = .199) $\tilde{P}$ = .190 N = 278 WN = 21,395	(P = .173) $\tilde{P}$ = .160 N = 454 WN = 439,697	(1) NS (2) NS

NOTE: These analyses were restricted to those who entered two-year postsecondary institutions. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell size, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two a priori contrasts were formed from the adjusted proportions: (1) column one versus column two, and (2) column one versus column three.

Table II.28

Rates of Attending Upward Bound Host Institutions As a Function of Upward Bound Participation Pattern

Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
Typical	Atypical	Nonparticipant	
($\underset{\sim}{P}$ = .533) P = .533 N = 1,171 WN = 76,960	($\underset{\sim}{P}$ = .347) P = .354 N = 506 WN = 38,567	($\underset{\sim}{P}$ = .317) P = .359 N = 736 WN = 762,304	(1) $p < .01$ (2) $p < .01$

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, $\underset{\sim}{P}$ (in parentheses), (2) adjusted weighted proportions, P (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two a priori contrasts were formed from the adjusted proportions: (1) column one versus column two, and (2) column one versus column three.

Table H.29

Rates of Attending Special Services Host Institutions As a Function of Upward Bound Participation Pattern

Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
Typical	Atypical	Nonparticipant	
(P = .546) $\tilde{P}$ = .546 N = 1,171 WN = 76,960	(P = .411) $\tilde{P}$ = .409 N = 506 WN = 38,567	(P = .474) $\tilde{P}$ = .472 N = 736 WN = 762,304	(1) $p < .01$ (2) NS

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted proportions: (1) column one versus column two, and (2) column one versus column three.

Table H.30

Major Course of Study As a Function of Upward Bound Participation Pattern

Major Course Of Study	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Education and Related Fields	(P = .274) $\tilde{P}$ = .274	(P = .211) $\tilde{P}$ = .205	(P = .125) $\tilde{P}$ = .219	(1) NS (2) NS
Humanities	(P = .051) $\tilde{P}$ = .051	(P = .117) $\tilde{P}$ = .125	(P = .090) $\tilde{P}$ = .101	(1) NS (2) NS
Other Nonscientific Academic Fields	(P = .343) $\tilde{P}$ = .343	(P = .277) $\tilde{P}$ = .269	(P = .327) $\tilde{P}$ = .349	(1) NS (2) NS
Social Sciences	(P = .161) $\tilde{P}$ = .161	(P = .220) $\tilde{P}$ = .217	(P = .029) $\tilde{P}$ = .037	(1) NS (2) $p < .01$
Natural Sciences, Engineering, and Related Fields	(P = .170) $\tilde{P}$ = .170	(P = .176) $\tilde{P}$ = .183	(P = .430) $\tilde{P}$ = .294	(1) NS (2) NS
Number of Cases	304	81	102	
Weight Total	50,952	17,917	243,525	

NOTE: These analyses were restricted to PSE entrants in the 11th and 12th grade cohort who last attended a four-year institution. Two entries are provided in each cell: (1) raw weighted column proportions, P (in parentheses), and (2) adjusted weighted column proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group). Small cell sizes led to insufficient data for within stratum estimates in some strata; therefore, results should be viewed with caution.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.31

Rates of Reported Availability of Tutoring Services At Institution Last Attended As a Function of Upward Bound Participation Pattern And Special Services Host Status of Institution

Special Services Host Status Of Institution Last Attended	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Not Special Services Host	(P = .924) $\tilde{P}$ = .924 N = 467 WN = 35,193	(P = .885) $\tilde{P}$ = .881 N = 268 WN = 23,135	(P = .840) $\tilde{P}$ = .794 N = 395 WN = 398,064	(1) NS (2) $p < .01$
Special Services Host	(P = .927) $\tilde{P}$ = .927 N = 584 WN = 41,767	(P = .934) $\tilde{P}$ = .925 N = 197 WN = 15,330	(P = .932) $\tilde{P}$ = .931 N = 288 WN = 362,030	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.32

Rates of Reported Availability of Counseling Services At Postsecondary Institutions Last Attended As a Function of Upward Bound Participation Pattern And Special Services Host Status of Institution

Special Services Host Status Of Institution Last Attended	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Not Special Services Host	(P = .977) $\tilde{P}$ = .977 N = 471 WN = 35,234	(P = .987) $\tilde{P}$ = .999 N = 269 WN = 23,135	(P = .936) $\tilde{P}$ = .951 N = 395 WN = 398,064	(1) NS (2) NS
Special Services Host	(P = .985) $\tilde{P}$ = .985 N = 586 WN = 41,726	(P = .992) $\tilde{P}$ = .990 N = 197 WN = 15,330	(P = .995) $\tilde{P}$ = .980 N = 288 WN = 362,030	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.33

Rates of Reported Availability of Remedial Courses At Postsecondary Institutions Last Attended As a Function of Upward Bound Participation Pattern And Special Services Host Status of Institution

Special Services Host Status Of Institution Last Attended	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Not Special Services Host	(P = .947) $\tilde{P}$ = .947 N = 470 WN = 35,260	(P = .887) $\tilde{P}$ = .895 N = 269 WN = 23,232	(P = .869) $\tilde{P}$ = .894 N = 396 WN = 398,064	(1) $p < .05$ (2) NS
Special Services Host	(P = .964) $\tilde{P}$ = .964 N = 585 WN = 41,699	(P = .972) $\tilde{P}$ = .970 N = 195 WN = 15,233	(P = .962) $\tilde{P}$ = .965 N = 288 WN = 362,030	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.34

Reported Participation in Available Tutoring Services
As a Function of Upward Bound Participation Pattern
And Special Services Host Status of Institution Last Attended

Special Services Host Status	Participation in Tutoring Services	Upward Bound Participation Pattern a/			Significance Level Of Contrasts b/
		Typical	Atypical	Nonparticipant	
Not Host	Did Not Participate	(P = .326) P = .326	(P = .324) P = .327	(P = .520) P = .421	(1) NS (2) p < .05
	Participated Infrequently	(P = .244) P = .244	(P = .262) P = .235	(P = .159) P = .108	(1) NS (2) p < .01
	Participated Occasionally	(P = .286) P = .286	(P = .263) P = .299	(P = .262) P = .385	(1) NS (2) NS
	Participated Frequently	(P = .144) P = .144	(P = .151) P = .140	(P = .058) P = .087	(1) NS (2) NS
	Mean Value c/	(M = 2.25) M = 2.25	(M = 2.24) M = 2.25	(M = 1.86) M = 2.14	(1) NS (2) NS
	Number of Cases	427	232	323	
	Weight Total	32,524	20,475	334,557	
Host	Did Not Participate	(P = .294) P = .294	(P = .414) P = .402	(P = .525) P = .467	(1) p < .05 (2) p < .05
	Participated Infrequently	(P = .245) P = .245	(P = .205) P = .202	(P = .242) P = .234	(1) NS (2) NS
	Participated Occasionally	(P = .292) P = .292	(P = .241) P = .247	(P = .188) P = .212	(1) NS (2) NS
	Participated Frequently	(P = .169) P = .169	(P = .140) P = .150	(P = .046) P = .086	(1) NS (2) p < .05
	Mean Value c/	(M = 2.34) M = 2.34	(M = 2.11) M = 2.14	(M = 1.75) M = 1.92	(1) NS (2) p < .01
	Number of Cases	546	183	265	
	Weight Total	38,735	14,320	337,517	

NOTE: These analyses were restricted to PSE entrants who reported availability of tutoring services at institution last attended. The participation variable reported was computed as an aggregate variable over responses to participation in all specified tutoring services (see Appendix E). Two entries are provided in each cell: (1) raw weighted column proportions or means within major host-status breakdown, P or M (in parentheses), and (2) adjusted weighted column proportions or means, P or M (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

a/ Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

b/ Two *a priori* contrasts were formed from the adjusted column proportions or means within each row: (1) column one versus column two, and (2) column one versus column three.

c/ Averages were taken for a four-valued scaling (from 1 to 4 in the order given) of extent of participation.

Table H.35

Reported Participation in Available Counseling Services
As a Function of Upward Bound Participation Pattern
And Special Services Host Status of Institution Last Attended

Special Services Host Status	Participation in Counseling Services	Upward Bound Participation Pattern[a/]			Significance Level Of Contrasts[b/]
		Typical	Atypical	Nonparticipant	
Not Host	Did Not Participate	($\underset{\sim}{P}$ = .249) P = .249	($\underset{\sim}{P}$ = .235) P = .245	($\underset{\sim}{P}$ = .374) P = .297	(1) NS (2) NS
	Participated Infrequently	($\underset{\sim}{P}$ = .421) P = .421	($\underset{\sim}{P}$ = .380) P = .360	($\underset{\sim}{P}$ = .432) P = .436	(1) NS (2) NS
	Participated Occasionally	($\underset{\sim}{P}$ = .274) P = .274	($\underset{\sim}{P}$ = .285) P = .292	($\underset{\sim}{P}$ = .168) P = .239	(1) NS (2) NS
	Participated Frequently	($\underset{\sim}{P}$ = .055) P = .055	($\underset{\sim}{P}$ = .101) P = .103	($\underset{\sim}{P}$ = .027) P = .028	(1) NS (2) NS
	Mean Value[c/]	($\underset{\sim}{M}$ = 2.14) M = 2.14	($\underset{\sim}{M}$ = 2.25) M = 2.25	($\underset{\sim}{M}$ = 1.85) M = 2.00	(1) NS (2) NS
	Number of Cases	461	265	377	
	Weight Total	34,415	22,831	372,467	
Host	Did Not Participate	($\underset{\sim}{P}$ = .199) P = .199	($\underset{\sim}{P}$ = .299) P = .259	($\underset{\sim}{P}$ = .500) P = .345	(1) $p < .05$ (2) $p < .05$
	Participated Infrequently	($\underset{\sim}{P}$ = .413) P = .413	($\underset{\sim}{P}$ = .395) P = .390	($\underset{\sim}{P}$ = .302) P = .294	(1) NS (2) $p < .05$
	Participated Occasionally	($\underset{\sim}{P}$ = .335) P = .335	($\underset{\sim}{P}$ = .233) P = .274	($\underset{\sim}{P}$ = .187) P = .324	(1) NS (2) NS
	Participated Frequently	($\underset{\sim}{P}$ = .052) P = .052	($\underset{\sim}{P}$ = .072) P = .077	($\underset{\sim}{P}$ = .011) P = .038	(1) NS (2) NS
	Mean Value[c/]	($\underset{\sim}{M}$ = 2.24) M = 2.24	($\underset{\sim}{M}$ = 2.08) M = 2.17	($\underset{\sim}{M}$ = 1.71) M = 2.05	(1) NS (2) NS
	Number of Cases	576	196	286	
	Weight Total	41,111	15,214	360,248	

NOTE: These analyses were restricted to PSE entrants who reported availability of counseling services at institution last attended. The participation variable reported was computed as an aggregate variable over responses to participation in all specified counseling services (see Appendix E). Two entries are provided in each cell: (1) raw weighted column proportions or means within major host-status breakdown, $\underset{\sim}{P}$ or $\underset{\sim}{M}$ (in parentheses), and (2) adjusted weighted column proportions or means, P or M (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a/] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b/] Two a priori contrasts were formed from the adjusted column proportions or means within each row: (1) column one versus column two, and (2) column one versus column three.

[c/] Averages were taken for a four-valued scaling (from 1 to 4 in the order given) of extent of participation.

Table H.36

Reported Participation in Available Remedial Services As a Function of Upward Bound Participation Pattern And Special Services Host Status of Institution Last Attended

Special Services Host Status	Participation in Remedial Services	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
		Typical	Atypical	Nonparticipant	
Not Host	Did Not Participate	(P = .384) P = .384	(P = .321) P = .311	(P = .526) P = .312	(1) NS (2) NS
	Participated Infrequently	(P = .286) P = .286	(P = .286) P = .305	(P = .271) P = .363	(1) NS (2) NS
	Participated Occasionally	(P = .260) P = .260	(P = .292) P = .284	(P = .134) P = .222	(1) NS (2) NS
	Participated Frequently	(P = .070) P = .070	(P = .101) P = .100	(P = .069) P = .102	(1) NS (2) NS
	Mean Value[c]	(M = 2.02) M = 2.02	(M = 2.17) M = 2.17	(M = 1.75) M = 2.12	(1) NS (2) NS
	Number of Cases	444	241	351	
	Weight Total	33,396	20,599	346,067	
Host	Did Not Participate	(P = .363) P = .363	(P = .470) P = .426	(P = .648) P = .436	(1) NS (2) NS
	Participated Infrequently	(P = .307) P = .307	(P = .279) P = .298	(P = .211) P = .289	(1) NS (2) NS
	Participated Occasionally	(P = .243) P = .243	(P = .170) P = .189	(P = .092) P = .128	(1) NS (2) $p < .05$
	Participated Frequently	(P = .087) P = .087	(P = .081) P = .087	(P = .050) P = .146	(1) NS (2) NS
	Mean Value[c]	(M = 2.05) M = 2.05	(M = 1.86) M = 1.94	(M = 1.54) M = 1.98	(1) NS (2) NS
	Number of Cases	562	188	275	
	Weight Total	40,188	14,807	348,280	

NOTE: These analyses were restricted to PSE entrants who reported availability of remedial services at institution last attended. The participation variable reported was computed as an aggregate variable over responses to participation in all specified remedial services (see Appendix E). Two entries are provided in each cell: (1) raw weighted column proportions or means within major host-status breakdown, P or M (in parentheses), and (2) adjusted weighted column proportions or means, P or M (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted column proportions or means within each row: (1) column one versus column two, and (2) column one versus column three.

[c] Averages were taken for a four-valued scaling (from 1 to 4 in the order given) of extent of participation.

Table H.37

Rates of Receiving Specified Types of Grants and Scholarships During Most Recent Year of Postsecondary Education As a Function of Upward Bound Participation Pattern

Type of Grant or Scholarship	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Basic Educational Opportunity Grant	(P = .792) P = .792	(P = .667) P = .701	(P = .336) (P = .594)	(1) p < .01 (2) p < .01
Supplemental Educational Opportunity Grant	(P = .199) P = .199	(P = .144) P = .147	(P = .043) P = .078	(1) NS (2) p < .01
ROTC Scholarship Or Stipend	(P = .013) P = .013	(P = .006) P = .007	(P = .005) P = .006	(1) NS (2) NS
Other Federal Scholarship	(P = .018) P = .018	(P = .021) P = .021	(P = .008) P = .009	(1) NS (2) NS
Veterans Administration Programs	(P = .035) P = .035	(P = .035) P = .039	(P = .033) P = .045	(1) NS (2) NS
Social Security Benefits	(P = .115) P = .115	(P = .100) P = .096	(P = .089) P = .087	(1) NS (2) NS
State Scholarship	(P = .132) P = .132	(P = .075) P = .074	(P = .089) P = .091	(1) p < .01 (2) NS
Other Scholarship Or Grant	(P = .217) P = .217	(P = .161) P = .145	(P = .149) P = .097	(1) p < .05 (2) p < .01
Number of Cases	1,012	448	617	
Weight Total	76,960	38,467	762,304	

NOTE: These analyses were restricted to PSE entrants. Two entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), and (2) adjusted weighted proportions, P (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.38

Rates of Receiving Specified Types of Loans During Most Recent Year of Postsecondary Education As a Function of Upward Bound Participation Pattern

Type of Loan	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Federal Guaranteed Student Loan	$(\underline{P} = .083)$ $\tilde{P} = .083$	$(\underline{P} = .087)$ $\tilde{P} = .088$	$(\underline{P} = .080)$ $\tilde{P} = .056$	(1) NS (2) NS
State Loan	$(\underline{P} = .020)$ $\tilde{P} = .020$	$(\underline{P} = .014)$ $\tilde{P} = .016$	$(\underline{P} = .010)$ $\tilde{P} = .020$	(1) NS (2) NS
National Defense (Direct) Student Loan	$(\underline{P} = .272)$ $\tilde{P} = .272$	$(\underline{P} = .220)$ $\tilde{P} = .228$	$(\underline{P} = .062)$ $\tilde{P} = .104$	(1) NS (2) $p < .01$
Other Loan	$(\underline{P} = .049)$ $\tilde{P} = .049$	$(\underline{P} = .064)$ $\tilde{P} = .068$	$\underline{P} = .058$ $\tilde{P} = .071$	(1) NS (2) NS
Number of Cases	1,007	446	614	
Weight Total	76,960	38,467	762,304	

NOTE: These analyses were restricted to PSE entrants. Two entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), and (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.39

Rates of Using Specified Types of Earnings or Savings To Finance Most Recent Year of Postsecondary Education As a Function of Upward Bound Participation Pattern

Type of Earning or Savings	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Summer Earnings	(P = .213) $\tilde{P}$ = .213	(P = .265) $\tilde{P}$ = .250	(P = .320) $\tilde{P}$ = .237	(1) NS (2) NS
College Sponsored Work Programs (While Taking Courses)	(P = .288) $\tilde{P}$ = .288	(P = .239) $\tilde{P}$ = .239	(P = .138) $\tilde{P}$ = .161	(1) NS (2) $p < .01$
Other Earnings While Taking Courses	(P = .159) $\tilde{P}$ = .159	(P = .182) $\tilde{P}$ = .163	(P = .284) $\tilde{P}$ = .176	(1) NS (2) NS
Number of Cases	970	425	592	
Weight Total	76,960	38,467	762,304	

NOTE: These analyses were restricted to PSE entrants. Two entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), and (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.40

Rates of Receiving Some Form of Grant During Most Recent Year of Postsecondary Education As a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	(P = .864) $\tilde{P}$ = .864 N = 70 WN = 6,043	(P = .694) $\tilde{P}$ = .639 N = 64 WN = 6,716	(P = .470) $\tilde{P}$ = .571 N = 111 WN = 116,527	(1) $p < .05$ (2) $p < .0$[illegible]
Two Year Academic Program	(P = .749) $\tilde{P}$ = .749 N = 190 WN = 14,544	(P = .710) $\tilde{P}$ = .741 N = 128 WN = 10,928	(P = .468) $\tilde{P}$ = .614 N = 184 WN = 225,805	(1) NS (2) $p < .05$
Four Year or Greater Academic Program	(P = .940) $\tilde{P}$ = .940 N = 758 WN = 56,373	(P = .856) $\tilde{P}$ = .892 N = 255 WN = 20,823	(P = .605) $\tilde{P}$ = .794 N = 325 WN = 419,972	(1) NS (2) $p < .01$

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Small cell sizes in this row led to insufficient data for within stratum estimates in some strata; therefore, results should be viewed with caution.

Table H.41

Rates of Receiving Some Form of Loan During Most Recent Year of Postsecondary Education As a Function of Upward Bound Participation Pattern And Level of Offering of School Last Attended

Level of Offering of Institution Last Attended[a/]	Upward Bound Participation Pattern[b/]			Significance Level Of Contrasts[c/]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d/]	(P = .263) $\tilde{P}$ = .263 N = 69 WN = 5,943	(P = .382) $\tilde{P}$ = .412 N = 64 WN = 6,716	(P = .341) $\tilde{P}$ = .412 N = 110 WN = 116,002	(1) NS (2) NS
Two Year Academic Program	(P = .122) $\tilde{P}$ = .122 N = 190 WN = 14,568	(P = .145) $\tilde{P}$ = .158 N = 129 WN = 10,774	(P = .072) $\tilde{P}$ = .101 N = 182 WN = 225,329	(1) NS (2) NS
Four Year or Greater Academic Program	(P = .490) $\tilde{P}$ = .490 N = 758 WN = 56,449	(P = .476) $\tilde{P}$ = .483 N = 255 WN = 20,976	(P = .278) $\tilde{P}$ = .337 N = 325 WN = 420,973	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a/] Excluding graduate study.

[b/] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c/] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

[d/] Small cell sizes in this row led to insufficient data for within stratum estimates in some strata; therefore, results should be viewed with caution.

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Table H.42

Rates of Using Some Form of Earnings or Savings To Finance Most Recent Year of Postsecondary Education As a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a/]	Upward Bound Participation Pattern[b/]			Significance Level Of Contrasts[c/]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d/]	($\underset{\sim}{P}$ = .505) P = .505 N = 70 WN = 6,150	($\underset{\sim}{P}$ = .423) P = .491 N = 64 WN = 6,716	($\underset{\sim}{P}$ = .376) P = .370 N = 111 WN = 117,249	(1) NS (2) NS
Two Year Academic Program	($\underset{\sim}{P}$ = .486) P = .486 N = 191 WN = 14,619	($\underset{\sim}{P}$ = .522) P = .492 N = 129 WN = 10,774	($\underset{\sim}{P}$ = .539) P = .421 N = 184 WN = 225,805	(1) NS (2) NS
Four Year or Greater Academic Program	($\underset{\sim}{P}$ = .596) P = .596 N = 759 WN = 56,191	($\underset{\sim}{P}$ = .664) P = .631 N = 256 WN = 20,976	($\underset{\sim}{P}$ = .721) P = .615 N = 323 WN = 419,250	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a/] Excluding graduate study.

[b/] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c/] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

[d/] Small cell sizes in this row led to insufficient data for within stratum estimates in some strata; therefore, results should be viewed with caution.

Table H.43

Pattern of Financial Support During Last Year of Postsecondary Study
As a Function of Upward Bound Participation Pattern
And Number of Terms of Postsecondary Education

Number of Terms of Postsecondary Education[a]	Aid Packaging	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
		Typical	Atypical	Nonparticipant	
Eight or Fewer Terms	No Aid Received	(P = .033) P = .033	(P = .003) P = .064	(P = .147) P = .126	(1) p < .05 (2) p < .01
	Savings or Earnings Only	(P = .069) P = .069	(P = .155) P = .135	(P = .249) P = .167	(1) p < .05 (2) p < .01
	Loans Only	(P = .009) P = .009	(P = .010) P = .015	(P = .034) P = .042	(1) NS (2) NS
	Loans and Savings Or Earnings	(P = .026) P = .02[illegible]	(P = .033) P = .028	(P = .035) P = .012	(1) NS (2) NS
	Grants or Scholarships Only	(P = .39[illegible]) P = .390	(P = .245) P = .260	(P = .219) P = .335	(1) p < .01 (2) NS
	Grants or Scholarships And Savings or Earnings	(P = .213) P = .21[illegible]	(P = .230) P = .222	(P = .198) P = .150	(1) NS (2) NS
	Grants or Scholarships And Loans	(P = .098) P = .098	(P = .131) P = .138	(P = .063) P = .094	(1) NS (2) NS
	Grants or Scholarships And Loans and Savings or Earnings	(P = .163) P = .163	(P = .113) P = .118	(P = .054) P = .074	(1) NS (2) p < .05
	Number of Cases	429	239	386	
	Weight Total	33,983	20,859	490,117	
Nine or More Terms	No Aid Received	(P = .014) P = .014	(P = .018) P = .015	(P = .057) P = .048	(1) NS (2) NS
	Savings or Earnings Only	(P = .048) P = .048	(P = .074) P = .044	(P = .305) P = .091	(1) NS (2) NS
	Loans Only	(P = .007) P = .007	(P = .010) P = .010	(P = .038) P = .015	(1) NS (2) NS
	Loans and Savings Or Earnings	(P = .007) P = .007	(P = .032) P = .034	(P = .038) P = .044	(1) NS (2) NS
	Grants or Scholarships Only	(P = .285) P = .285	(P = .226) P = .241	(P = .114) P = .218	(1) NS (2) NS
	Grants or Scholarships And Savings or Earnings	(P = .243) P = .243	(P = .225) P = .234	(P = .224) P = .160	(1) NS (2) NS
	Grants or Scholarships And Loans	(P = .127) P = .127	(P = .111) P = .121	(P = .[illegible]) P = .077	(1) NS (2) NS
	Grants or Scholarships And Loans and Savings or Earnings	(P = .330) P = .330	(P = .304) P = .303	(P = .188) P = .247	(1) NS (2) NS
	Number of Cases	583	207	229	
	Weight Total	33,983	20,859	490,117	
Nine or More Terms	No Aid Received	(P = .014) P = .014	(P = .018) P = .015	(P = .057) P = .0[illegible]	(1) NS (2) NS
	Savings or Earnings Only	(P = .048) P = .048	(P = .074) P = .044	(P = .305) P = .091	(1) NS (2) NS
	Loans Only	(P = .007) P = .007	(P = .010) P = .010	(P = .038) P = .015	(1) NS (2) NS
	Loans and Savings Or Earnings	(P = .007) P = .007	(P = .032) P = .034	(P = .038) P = .044	(1) NS (2) NS
	Grants or Scholarships Only	(P = .285) P = .285	(P = .226) P = .241	(P = .114) P = .218	(1) NS (2) NS
	Grants or Scholarships And Savings or Earnings	(P = .243) P = .243	(P = .225) P = .234	(P = .224) P = .160	(1) NS (2) NS
	Grants or Scholarships And Loans	(P = .127) P = .127	(P = .111) P = .121	(P = .037) P = .077	(1) NS (2) NS
	Grants or Scholarships And Loans and Savings or Earnings	(P = .250) P = .250	(P = .304) P = .303	(P = .188) P = .247	(1) NS (2) NS
	Number of Cases	583	207	229	
	Weight Total	42,929	17,607	272,187	

NOTE: These analyses were restricted to PHE entrants. Two entries are provided in each cell: (1) raw weighted column proportions within major terms-attended breakdown, P (in parentheses), and (2) adjusted weighted column proportions, P (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

a/ Number of terms is quarter-system based; summer term attendance is included.

b/ Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

c/ Two *a priori* contrasts were formed from the adjusted column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.44

Average Grant Amount Received During Most Recent Year of Postsecondary Education As a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	(M = $1,311) M = $1,311 N = 63 WN = 6,279	(M = $ 810) M = $ 843 N = 56 WN = 6,526	(M = $ 324) M = $ 522 N = 104 WN = 116,659	(1) NS (2) p < .01
Two Year Academic Program	(M = $ 747) M = $ 747 N = 169 WN = 14,806	(M = $ 618) M = $ 644 N = 115 WN = 11,116	(M = $ 316) M = $ 502 N = 173 WN = 223,978	(1) NS (2) p < .01
Four Year or Greater Academic Program	(M = $1,623) M = $1,623 N = 660 WN = 55,580	(M = $1,348 M = $1,360 N = 219 WN = 20,825	(M = $ 834) M = $1,088 N = 305 WN = 421,962	(1) p < .05 (2) p < .01

NOTE: These analyses were restricted to PSE entrants; the data were trimmed by excluding cases with suspect values (i.e., values greater than $8,000). Four entries are provided in each cell: (1) raw weighted means, M (in parentheses), (2) adjusted weighted means, M (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two *a priori* contrasts were formed from the adjusted means within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Cell sizes in this row are sufficiently small to ensure that within stratum assumptions of the analytic model are violated; therefore, results should be viewed with extreme caution.

Table H.45

Average Loan Amount Received During Most Recent Year of Postsecondary Education As a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	(M̰ = \$272) M̃ = \$272 N = 67 WN = 5,801	(M̰ = \$468) M̃ = \$558 N = 64 WN = 7,087	(M̰ = \$447) M̃ = \$494 N = 109 WN = 117,574	(1) NS (2) $p < .05$
Two Year Academic Program	(M̰ = \$ 93) M̃ = \$ 93 N = 188 WN = 14,702	(M̰ = \$ 96) M̃ = \$ 99 N = 128 WN = 11,146	(M̰ = \$ 47) M̃ = \$ 55 N = 181 WN = 225,559	(1) NS (2) NS
Four Year or Greater Academic Program	(M̰ = \$486) M̃ = \$486 N = 723 WN = 56,457	(M̰ = \$387 M̃ = \$403 N = 239 WN = 20,234	(M̰ = \$303) M̃ = \$376 N = 322 WN = 419,171	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants; the data were trimmed by excluding cases with suspect values (i.e., values greater than \$4,800). Four entries are provided in each cell: (1) raw weighted means, M (in parentheses), (2) adjusted weighted means, M̃ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two *a priori* contrasts were formed from the adjusted means within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Small cell sizes in this row led to insufficient data for within cell estimates in some strata; therefore, results should be viewed with caution.

Table H.46

Average Amount of Earnings or Savings Used to Finance Most Recent Year of Postsecondary Education As a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	(M = $282) M = $282 N = 62 WN = 5,846	(M = $174) M = $211 N = 58 WN = 6,645	(M = $270) M = $239 N = 106 WN = 123,641	(1) NS (2) NS
Two Year Academic Program	(M = $210) M = $210 N = 172 WN = 14,764	(M = $378) M = $360 N = 119 WN = 10,507	(M = $323) M = $209 N = 165 WN = 228,474	(1) p < .05 (2) NS
Four Year or Greater Academic Program	(M = $442) M = $442 N = 692 WN = 56,349	(M = $492) M = $459 N = 236 WN = 21,316	(M = $660) M = $552 N = 302 WN = 410,789	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants; the data were trimmed by excluding cases with suspect values (i.e., values greater than $7,000). Four entries are provided in each cell: (1) raw weighted means, M (in parentheses), (2) adjusted weighted means, M (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two *a priori* contrasts were formed from the adjusted means within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Small cell sizes in this row led to insufficient data for within stratum estimates in some strata; therefore, results should be viewed with caution.

Table H.47

Reported Adequacy of Financial Assistance During Last Year of Postsecondary Study From Scholarships and Grants As a Function of Upward Bound Participation Pattern And Cost Category of Institution Last Attended

Cost Category	Adequacy of Scholarships and Grants	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
		Typical	Atypical	Nonparticipant	
Less than $1,000	No Support Needed	($\underset{\sim}{P}$ = .100) P = .100	($\underset{\sim}{P}$ = .108) P = .067	($\underset{\sim}{P}$ = .361) P = .178	(1) NS (2) $p < .05$
	Very Adequate	($\underset{\sim}{P}$ = .257) P = .257	($\underset{\sim}{P}$ = .228) P = .239	($\underset{\sim}{P}$ = .122) P = .183	(1) NS (2) NS
	Adequate	($\underset{\sim}{P}$ = .366) P = .366	($\underset{\sim}{P}$ = .338) P = .348	($\underset{\sim}{P}$ = .201) P = .291	(1) NS (2) NS
	Inadequate	($\underset{\sim}{P}$ = .142) P = .142	($\underset{\sim}{P}$ = .097) P = .099	($\underset{\sim}{P}$ = .079) P = .100	(1) NS (2) NS
	Not Received Or Very Inadequate	($\underset{\sim}{P}$ = .135) P = .135	($\underset{\sim}{P}$ = .228) P = .247	($\underset{\sim}{P}$ = .237) P = .247	(1) $p < .01$ (2) $p < .05$
	Number of Cases	726	331	528	
	Weight Total	54,552	27,962	637,368	
$1,000 Or More	No Support Needed	($\underset{\sim}{P}$ = .044) P = .044	($\underset{\sim}{P}$ = .022) P = .000	($\underset{\sim}{P}$ = .243) P = .030	(1) NS (2) NS
	Very Adequate	($\underset{\sim}{P}$ = .335) P = .335	($\underset{\sim}{P}$ = .446) P = .432	($\underset{\sim}{P}$ = .076) P = .126	(1) NS (2) $p < .05$
	Adequate	($\underset{\sim}{P}$ = .418) P = .418	($\underset{\sim}{P}$ = .304) P = .339	($\underset{\sim}{P}$ = .229) P = .349	(1) NS (2) NS
	Inadequate	($\underset{\sim}{P}$ = .126) P = .126	($\underset{\sim}{P}$ = .130) P = .131	($\underset{\sim}{P}$ = .216) P = .296	(1) NS (2) $p < .05$
	Not Received Or Very Inadequate	($\underset{\sim}{P}$ = .077) P = .077	($\underset{\sim}{P}$ = .098) P = .099	($\underset{\sim}{P}$ = .236) P = .199	(1) NS (2) $p < .05$
	Number of Cases	302	109	107	
	Weight Total	22,408	10,606	124,936	

NOTE: These analyses were restricted to PSE entrants. Two entries are provided in each cell: (1) raw weighted column proportions within major cost category breakdown, $\underset{\sim}{P}$ (in parentheses), and (2) adjusted weighted column proportions, P (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.48

Rates of Reporting Grants and Scholarships As Unneeded or Adequate During Last Year of Postsecondary Study As a Function of Upward Bound Participation Pattern And Cost Category of Institution Last Attended

Cost Category of Institution Last Attended	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Less than $1,000	(P = .724) $\tilde{P}$ = .724 N = 726 WN = 54,552	(P = .674) $\tilde{P}$ = .654 N = 331 WN = 27,962	(P = .685) $\tilde{P}$ = .652 N = 528 WN = 637,368	(1) NS (2) NS
$1,000 or More	(P = .797) $\tilde{P}$ = .797 N = 302 WN = 22,408	(P = .772) $\tilde{P}$ = .770 N = 109 WN = 10,606	(P = .548) $\tilde{P}$ = .505 N = 107 WN = 124,936	(1) NS (2) $p < .01$

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

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Table H.49

Reported Adequacy of Financial Assistance During Last Year of Postsecondary Study From Loans As a Function of Upward Bound Participation Pattern And Cost Category of Institution Last Attended

Cost Category	Adequacy of Loans	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
		Typical	Atypical	Nonparticipant	
Less than $1,000	No Support Needed	($\underset{\sim}{P}$ = .315) P = .315	($\underset{\sim}{P}$ = .311) P = .277	($\underset{\sim}{P}$ = .541) P = .393	(1) NS (2) NS
	Very Adequate	($\underset{\sim}{P}$ = .095) P = .095	($\underset{\sim}{P}$ = .071) P = .074	($\underset{\sim}{P}$ = .039) P = .051	(1) NS (2) $p < .05$
	Adequate	($\underset{\sim}{P}$ = .197) P = .197	($\underset{\sim}{P}$ = .162) P = .171	($\underset{\sim}{P}$ = .112) P = .127	(1) NS (2) $p < .05$
	Inadequate	($\underset{\sim}{P}$ = .062) P = .062	($\underset{\sim}{P}$ = .061) P = .063	($\underset{\sim}{P}$ = .027) P = .033	(1) NS (2) NS
	Not Received Or Very Inadequate	($\underset{\sim}{P}$ = .331) P = .331	($\underset{\sim}{P}$ = .394) P = .414	($\underset{\sim}{P}$ = .281) P = .396	(1) $p < .05$ (2) NS
	Number of Cases	725	331	530	
	Weight Total	54,552	27,886	637,368	
$1,000 Or More	No Support Needed	($\underset{\sim}{P}$ = .209) P = .209	($\underset{\sim}{P}$ = .188) P = .143	($\underset{\sim}{P}$ = .396) P = .243	(1) NS (2) NS
	Very Adequate	($\underset{\sim}{P}$ = .147) P = .147	($\underset{\sim}{P}$ = .331) P = .331	($\underset{\sim}{P}$ = .078) P = .167	(1) NS (2) NS
	Adequate	($\underset{\sim}{P}$ = .329) P = .329	($\underset{\sim}{P}$ = .216) P = .224	($\underset{\sim}{P}$ = .241) P = .240	(1) NS (2) NS
	Inadequate	($\underset{\sim}{P}$ = .084) P = .084	($\underset{\sim}{P}$ = .052) P = .050	($\underset{\sim}{P}$ = .050) P = .043	(1) NS (2) NS
	Not Received Or Very Inadequate	($\underset{\sim}{P}$ = .231) P = .231	($\underset{\sim}{P}$ = .213) P = .251	($\underset{\sim}{P}$ = .234) P = .307	(1) NS (2) NS
	Number of Cases	301	110	107	
	Weight Total	22,408	10,682	124,936	

NOTE: These analyses were restricted to PSE entrants. Two entries are provided in each cell: (1) raw weighted column proportions within major cost category breakdown, $\underset{\sim}{P}$ (in parentheses), and (2) adjusted weighted column proportions, P (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

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Table H.50

Rates of Reporting Loans
As Unneeded or Adequate
During Last Year of Postsecondary Study
As a Function of Upward Bound Participation Pattern
And Cost Category of Institution Last Attended

Cost Category of Institution Last Attended	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Less than $1,000	(P = .607) $\tilde{P}$ = .607 N = 725 WN = 54,552	(P = .545) $\tilde{P}$ = .523 N = 331 WN = 27,886	(P = .692) $\tilde{P}$ = .572 N = 530 WN = 637,368	(1) $p < .05$ (2) NS
$1,000 or More	(P = .685) $\tilde{P}$ = .685 N = 301 WN = 22,408	(P = .735) $\tilde{P}$ = .698 N = 110 WN = 10,682	(P = .716) $\tilde{P}$ = .650 N = 107 WN = 124,936	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two a priori contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.51

Reported Adequacy of Financial Assistance During Last Year of Postsecondary Study From Work Opportunities As a Function of Upward Bound Participation Pattern And Cost Category of Institution Last Attended

Cost Category	Adequacy of Work Opportunities	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
		Typical	Atypical	Nonparticipant	
Less than $1,000	No Support Needed	(P = .181) P = .181	(P = .195) P = .168	(P = .281) P = .183	(1) NS (2) NS
	Very Adequate	(P = .123) P = .123	(P = .113) P = .102	(P = .125) P = .063	(1) NS (2) NS
	Adequate	(P = .235) P = .235	(P = .280) P = .281	(P = .241) P = .222	(1) NS (2) NS
	Inadequate	(P = .155) P = .155	(P = .150) P = .159	(P = .136) P = .187	(1) NS (2) NS
	Not Received Or Very Inadequate	(P = .306) P = .306	(P = .262) P = .290	(P = .217) P = .347	(1) NS (2) NS
	Number of Cases	724	330	529	
	Weight Total	54,641	27,886	637,368	
$1,000 Or More	No Support Needed	(P = .111) P = .111	(P = .100) P = .106	(P = .223) P = .136	(1) NS (2) NS
	Very Adequate	(P = .141) P = .141	(P = .138) P = .126	(P = .151) P = .102	(1) NS (2) NS
	Adequate	(P = .312) P = .312	(P = .444) P = .420	(P = .221) P = .228)	(1) NS (2) NS
	Inadequate	(P = .201) P = .201	(P = .139) P = .121	(P = .200) P = .179	(1) NS (2) NS
	Not Received Or Very Inadequate	(P = .235) P = .235	(P = .180) P = .226	(P = .205) P = .355	(1) NS (2) NS
	Number of Cases	300	110	107	
	Weight Total	22,3[illegible]	10,682	124,936	

NOTE: These analyses were restricted to PSE entrants. Two entries are provided in each cell: (1) raw weighted column proportions within major cost category breakdown, P (in parentheses), and (2) adjusted weighted column proportions, P (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

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Table H.52

Rates of Reporting Work Opportunities
As Unneeded or Adequate
During Last Year of Postsecondary Study
As a Function of Upward Bound Participation Pattern
And Cost Category of Institution Last Attended

Cost Category of Institution Last Attended	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Less than $1,000	(P = .539) $\tilde{P}$ = .539 N = 724 WN = 54,641	(P = .588) $\tilde{P}$ = .551 N = 330 WN = 27,886	(P = .648) $\tilde{P}$ = .468 N = 529 WN = 637,368	(1) NS (2) NS
$1,000 or More	(P = .563) $\tilde{P}$ = .563 N = 300 WN = 22,319	(P = .681) $\tilde{P}$ = .653 N = 110 WN = 10,682	(P = .595) $\tilde{P}$ = .466 N = 107 WN = 124,936	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two a priori contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.53

Reported Adequacy of Financial Assistance During Last Year of Postsecondary Study From Total of Grants, Scholarships, Loans, and Work Opportunities As a Function of Upward Bound Participation Pattern And Cost Category of Institution Last Attended

Cost Category	Adequacy of Grants, Scholarships, Loans, and Work Opportunities	Upward Bound Participation Pattern[a/]			Significance Level Of Contrasts[b/]
		Typical	Atypical	Nonparticipant	
Less than $1,000	No Support Needed	($\underset{\sim}{P}$ = .082) P = .082	($\underset{\sim}{P}$ = .098) P = .063	($\underset{\sim}{P}$ = .280) P = .129	(1) NS (2) NS
	Very Adequate	($\underset{\sim}{P}$ = .173) P = .173	($\underset{\sim}{P}$ = .135) P = .134	($\underset{\sim}{P}$ = .085) P = .068	(1) NS (2) NS
	Adequate	($\underset{\sim}{P}$ = .387) P = .387	($\underset{\sim}{P}$ = .405) P = .420	($\underset{\sim}{P}$ = .322) P = .367	(1) NS (2) NS
	Inadequate	($\underset{\sim}{P}$ = .235) P = .235	($\underset{\sim}{P}$ = .212) P = .215	($\underset{\sim}{P}$ = .171) P = .220	(1) NS (2) NS
	Not Received Or Very Inadequate	($\underset{\sim}{P}$ = .123) P = .123	($\underset{\sim}{P}$ = .150) P = .168	($\underset{\sim}{P}$ = .142) P = .216	(1) NS (2) $p < .01$
	Number of Cases	751	346	564	
	Weight Total	54,512	28,272	641,330	
$1,000 Or More	No Support Needed	($\underset{\sim}{P}$ = .057) P = .057	($\underset{\sim}{P}$ = .020) P = .023	($\underset{\sim}{P}$ = .165) P = .054	(1) NS (2) NS
	Very Adequate	($\underset{\sim}{P}$ = .188) P = .188	($\underset{\sim}{P}$ = .394) P = .394	($\underset{\sim}{P}$ = .137) P = .163	(1) NS (2) NS
	Adequate	($\underset{\sim}{P}$ = .501) P = .501	($\underset{\sim}{P}$ = .367) P = .379	($\underset{\sim}{P}$ = .314) P = .369	(1) NS (2) NS
	Inadequate	($\underset{\sim}{P}$ = .202) P = .202	($\underset{\sim}{P}$ = .195) P = .160	($\underset{\sim}{P}$ = .267) P = .214	(1) NS (2) NS
	Not Received Or Very Inadequate	($\underset{\sim}{P}$ = .053) P = .053	($\underset{\sim}{P}$ = .024) P = .045	($\underset{\sim}{P}$ = .116) P = .200	(1) NS (2) $p < .05$
	Number of Cases	306	110	109	
	Weight Total	22,448	10,295	120,974	

NOTE: These analyses were restricted to PSE entrants. Two entries are provided in each cell: (1) raw weighted column proportions within major cost category breakdown, P (in parentheses), and (2) adjusted weighted column proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

a/ Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

b/ Two *a priori* contrasts were formed from the adjusted column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.54

Rates of Reporting Total of Grants, Scholarships, Loans, and Work Opportunities
As Unneeded or Adequate
During Last Year of Postsecondary Study
As a Function of Upward Bound Participation Pattern
And Cost Category of Institution Last Attended

Cost Category of Institution Last Attended	Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
	Typical	Atypical	Nonparticipant	
Less than $1,000	(P = .642) $\tilde{P}$ = .642 N = 751 WN = 54,512	(P = .638) $\tilde{P}$ = .617 N = 346 WN = 28,272	(P = .687) $\tilde{P}$ = .564 N = 564 WN = 641,330	(1) NS (2) NS
$1,000 or More	(P = .745) $\tilde{P}$ = .745 N = 306 WN = 22,448	(P = .781) $\tilde{P}$ = .795 N = 110 WN = 10,295	(P = .617) $\tilde{P}$ = .586 N = 109 WN = 120,974	(1) NS (2) $p < .05$

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.55

Reported Adequacy of Financial Assistance During Last Year of Postsecondary Study From Family Contributions As a Function of Upward Bound Participation Pattern And Cost Category of Institution Last Attended

Cost Category	Adequacy of Family Contributions	Upward Bound Participation Pattern[a/]			Significance Level Of Contrasts[b/]
		Typical	Atypical	Nonparticipant	
Less than $1,000	No Support Needed	$(\underset{\sim}{P} = .235)$ $\tilde{P} = .235$	$(\underset{\sim}{P} = .182)$ $\tilde{P} = .185$	$(\underset{\sim}{P} = .194)$ $\tilde{P} = .192$	(1) NS (2) NS
	Very Adequate	$(\underset{\sim}{P} = .101)$ $\tilde{P} = .101$	$(\underset{\sim}{P} = .123)$ $\tilde{P} = .093$	$(\underset{\sim}{P} = .263)$ $\tilde{P} = .140$	(1) NS (2) NS
	Adequate	$(\underset{\sim}{P} = .190)$ $\tilde{P} = .190$	$(\underset{\sim}{P} = .208)$ $\tilde{P} = .215$	$(\underset{\sim}{P} = .275)$ $\tilde{P} = .302$	(1) NS (2) $p < .05$
	Inadequate	$(\underset{\sim}{P} = .133)$ $\tilde{P} = .133$	$(\underset{\sim}{P} = .145)$ $\tilde{P} = .147$	$(\underset{\sim}{P} = .068)$ $\tilde{P} = .094$	(1) NS (2) NS
	Not Received Or Very Inadequate	$(\underset{\sim}{P} = .340)$ $\tilde{P} = .340$	$(\underset{\sim}{P} = .342)$ $\tilde{P} = .360$	$(\underset{\sim}{P} = .199)$ $\tilde{P} = .272$	(1) NS (2) NS
	Number of Cases	704	328	531	
	Weight Total	53,782	28,115	637,883	
$1,000 Or More	No Support Needed	$(\underset{\sim}{P} = .164)$ $\tilde{P} = .164$	$(\underset{\sim}{P} = .368)$ $\tilde{P} = .344$	$(\underset{\sim}{P} = .158)$ $\tilde{P} = .175$	(1) NS (2) NS
	Very Adequate	$(\underset{\sim}{P} = .080)$ $\tilde{P} = .080$	$(\underset{\sim}{P} = .054)$ $\tilde{P} = .088$	$(\underset{\sim}{P} = .214)$ $\tilde{P} = .144$	(1) NS (2) NS
	Adequate	$(\underset{\sim}{P} = .204)$ $\tilde{P} = .204$	$(\underset{\sim}{P} = .209)$ $\tilde{P} = .216$	$(\underset{\sim}{P} = .338)$ $\tilde{P} = .394$	(1) NS (2) NS
	Inadequate	$(\underset{\sim}{P} = .142)$ $\tilde{P} = .142$	$(\underset{\sim}{P} = .052)$ $\tilde{P} = .044$	$(\underset{\sim}{P} = .069)$ $\tilde{P} = .041$	(1) $p < .05$ (2) $p < .05$
	Not Received Or Very Inadequate	$(\underset{\sim}{P} = .410)$ $\tilde{P} = .410$	$(\underset{\sim}{P} = .317)$ $\tilde{P} = .308$	$(\underset{\sim}{P} = .220)$ $\tilde{P} = .245$	(1) NS (2) $p < .05$
	Number of Cases	295	105	108	
	Weight Total	23,083	10,452	124,516	

NOTE: These analyses were restricted to PSE entrants. Two entries are provided in each cell: (1) raw weighted column proportions within major cost category breakdown, P (in parentheses), and (2) adjusted weighted column proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a/] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b/] Two *a priori* contrasts were formed from the adjusted column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.56

Rates of Reporting Family Contributions As Unneeded or Adequate During Last Year of Postsecondary Study As a Function of Upward Bound Participation Pattern And Cost Category of Institution Last Attended

Cost Category of Institution Last Attended	Upward Bound Participation Pattern[a/]			Significance Level Of Contrasts[b/]
	Typical	Atypical	Nonparticipant	
Less than $1,000	(P = .526) $\tilde{P}$ = .526 N = 704 WN = 53,782	(P = .513) $\tilde{P}$ = .493 N = 328 WN = 28,115	(P = .733) $\tilde{P}$ = .635 N = 531 WN = 637,883	(1) NS (2) $p < .05$
$1,000 or More	(P = .449) $\tilde{P}$ = .449 N = 295 WN = 23,083	(P = .631) $\tilde{P}$ = .649 N = 105 WN = 10,452	(P = .711) $\tilde{P}$ = .713 N = 108 WN = 124,516	(1) NS (2) $p < .01$

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a/] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b/] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

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Table H.57

Average Percent of Total Idealized Financial Aid Package That Would Come From Loans and Work Study As a Function of Upward Bound Participation Pattern

Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
Typical	Atypical	Nonparticipant	
(M = 28.7%)	(M = 31.4%)	(M = 26.3%)	(1) NS
M = 28.7%	M = 31.5%	M = 27.7%	(2) NS
N = 1,001	N = 424	N = 629	
WN = 76,889	WN = 38,465	WN = 762,374	

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted means, M (in parentheses), (2) adjusted weighted means, M (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted means: (1) column one versus column two, and (2) column one versus column three.

Table H.58

Average Number of Terms Attending Postsecondary Institution As a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	(M = 5.78) $\tilde{M}$ = 5.78 N = 91 WN = 6,398	(M = 4.69) $\tilde{M}$ = 4.45 N = 78 WN = 6,965	(M = 4.86) $\tilde{M}$ = 4.32 N = 136 WN = 129,636	(1) $p < .05$ (2) NS
Two Year Academic Program	(M = 6.95) $\tilde{M}$ = 6.95 N = 215 WN = 14,717	(M = 6.25) $\tilde{M}$ = 6.31 N = 138 WN = 10,627	(M = 5.51) $\tilde{M}$ = 5.99 N = 222 WN = 206,091	(1) NS (2) NS
Four Year or Greater Academic Program	(M = 9.91) $\tilde{M}$ = 9.91 N = 856 WN = 55,792	(M = 9.62) $\tilde{M}$ = 9.74 N = 289 WN = 20,976	(M = 8.54) $\tilde{M}$ = 9.59 N = 376 WN = 424,367	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted means, M (in parentheses), (2) adjusted weighted means, $\tilde{M}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two *a priori* contrasts were formed from the adjusted means within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Small cell sizes in this row led to insufficient data for within stratum estimates in some strata; therefore, results should be viewed with caution.

Table H.59

Proportions of Individuals Graduated From or Currently Enrolled in a Postsecondary Institution As a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	(P = .705) $\tilde{P}$ = .705 N = 91 WN = 6,416	(P = .720) $\tilde{P}$ = .664 N = 78 WN = 7,029	(P = .692) $\tilde{P}$ = .597 N = 135 WN = 130,236	(1) NS (2) NS
Two Year Academic Program	(P = .519) $\tilde{P}$ = .519 N = 213 WN = 14,663	(P = .548) $\tilde{P}$ = .548 N = 134 WN = 10,657	(P = .537) $\tilde{P}$ = .496 N = 220 WN = 207,354	(1) NS (2) NS
Four Year or Greater Academic Program	(P = .663) $\tilde{P}$ = .663 N = 849 WN = 55,828	(P = .707) $\tilde{P}$ = .714 N = 286 WN = 20,882	(P = .811) $\tilde{P}$ = .781 N = 370 WN = 424,532	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Small cell sizes in this row led to insufficient data for within stratum estimates in some strata; therefore, results should be viewed with caution.

Table H.60

Proportions of Individuals Graduated From, Currently Enrolled In, or Intending to Return To a Postsecondary Institution as a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	(P = .914) $\tilde{P}$ = .914 N = 91 WN = 6,398	(P = .823) $\tilde{P}$ = .798 N = 78 WN = 7,167	(P = .870) $\tilde{P}$ = .838 N = 136 WN = 131,767	(1) NS (2) NS
Two Year Academic Program	(P = .824) $\tilde{P}$ = .824 N = 215 WN = 14,706	(P = .840) $\tilde{P}$ = .844 N = 136 WN = 10,657	(P = .782) $\tilde{P}$ = .810 N = 220 WN = 205,177	(1) NS (2) NS
Four Year or Greater Academic Program	(P = .884) $\tilde{P}$ = .884 N = 852 WN = 55,802	(P = .885) $\tilde{P}$ = .894 N = 285 WN = 20,744	(P = .928) $\tilde{P}$ = .929 N = 370 WN = 425,177	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Small cell sizes in this row led to insufficient data for within stratum estimates in some strata; therefore, results should be viewed with caution.

Table H.61

Rates of Full-Time-Only Attendance as a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	(P = .781) $\tilde{P}$ = .781 N = 93 WN = 6,525	(P = .731) $\tilde{P}$ = .686 N = 78 WN = 6,965	(P = .721) $\tilde{P}$ = .678 N = 135 WN = 128,204	(1) NS (2) NS
Two Year Academic Program	(P = .646) $\tilde{P}$ = .646 N = 213 WN = 14,487	(P = .683) $\tilde{P}$ = .677 N = 138 WN = 10,518	(P = .548) $\tilde{P}$ = .545 N = 222 WN = 207,718	(1) NS (2) NS
Four Year or Greater Academic Program	(P = .884) $\tilde{P}$ = .884 N = 855 WN = 55,825	(P = .833) $\tilde{P}$ = .837 N = 289 WN = 21,085	(P = .846) $\tilde{P}$ = .880 N = 373 WN = 426,200	(1) NS (2) NS

NOTE: These analyses were conducted for PSE entrants only. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Small cell sizes in this row led to insufficient data for within stratum estimates in some strata; therefore, results should be viewed with caution.

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Table H.62

Average Percent of Available Summer Term Sessions Attended As a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	(M = 36.7%) $\tilde{M}$ = 36.7% N = 91 WN = 6,398	(M = 46.6%) $\tilde{M}$ = 49.9% N = 78 WN = 6,965	(M = 40.1%) $\tilde{M}$ = 46.3% N = 136 WN = 129,636	(1) NS (2) NS
Two Year Academic Program	(M = 27.7%) $\tilde{M}$ = 27.7% N = 215 WN = 14,717	(M = 23.4%) $\tilde{M}$ = 23.3% N = 138 WN = 10,627	(M = 20.7%) $\tilde{M}$ = 22.3% N = 222 WN = 206,091	(1) NS (2) NS
Four Year or Greater Academic Program	(M = 40.2%) $\tilde{M}$ = 40.2% N = 856 WN = 55,792	(M = 34.8%) $\tilde{M}$ = 35.5% N = 289 WN = 20,976	(M = 23.6%) $\tilde{M}$ = 30.7% N = 376 WN = 424,367	(1) NS (2) $p < .05$

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted means, M (in parentheses), (2) adjusted weighted means, $\tilde{M}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two a priori contrasts were formed from the adjusted means within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Small cell sizes in this row led to insufficient data for within stratum estimates in some strata; therefore, results should be viewed with caution.

Table H.63

Average Postsecondary Grade Point Average at Institution Last Attended
As a Function of Upward Bound Participation Pattern
And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	(M = 2.13) M = 2.13 N = 26 WN = 2,395	(M = 1.86) M = 1.81 N = 16 WN = 1,936	(M = 2.40) M = 2.63 N = 26 WN = 55,728	(1) NS (2) $p < .05$
Two Year Academic Program	(M = 1.91) M = 1.91 N = 141 WN = 13,641	(M = 1.69) M = 1.74 N = 89 WN = 11,726	(M = 2.07) M = 1.95 N = 150 WN = 208,798	(1) NS (2) NS
Four Year or Greater Academic Program	(M = 2.05) M = 2.05 N = 695 WN = 62,878	(M = 1.98) M = 1.92 N = 224 WN = 24,805	(M = 2.40) M = 2.19 N = 294 WN = 495,824	(1) NS (2) $p < .05$

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted means, M (in parentheses), (2) adjusted weighted means, M (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two *a priori* contrasts were formed from the adjusted means within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Cell sizes in this row are sufficiently small to ensure that within stratum assumptions of the analytic model are violated; therefore, results should be viewed with extreme caution.

Table H.64

Average Postsecondary Grade Point Average for Non-Transferring Students As a Function of Upward Bound Participation Pattern And Level of Offering of Institution Attended

Level of Offering of Institution Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	(M = 2.07) M = 2.07 N = 23 WN = 2,168	(M = 1.72) M = 1.66 N = 13 WN = 1,622	(M = 2.44) M = 2.63 N = 23 WN = 52,399	(1) NS (2) $p < .05$
Two Year Academic Program[e]	(M = 1.79) M = 1.79 N = 121 WN = 11,784	(M = 1.66) M = 1.71 N = 78 WN = 10,369	(M = 2.04) M = 1.91 N = 138 WN = 197,667	(1) NS (2) NS
Four Year or Greater Academic Program	(M = 1.94) M = 1.94 N = 135 WN = 46,552	(M = 1.97) M = 1.92 N = 306 WN = 19,421	(M = 2.29) M = 2.21 N = 451 WN = 331,106	(1) NS (2) $p < .01$

NOTE: These analyses were restricted to PSE entrants who did not transfer from the originally entered institution. Four entries are provided in each cell: (1) raw weighted means, M (in parentheses), (2) adjusted weighted means, M (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two *a priori* contrasts were formed from the adjusted means within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Cell sizes in this row are sufficiently small to ensure that within stratum assumptions of the analytic model are violated; therefore, results should be viewed with extreme caution.

[e] Small cell sizes in this row led to insufficient data for within stratum estimates in some strata; therefore, results should be interpreted with caution.

Table H.65

Rates of Being Placed on Academic Probation As a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	($\underset{\sim}{P}$ = .161) P = .161 N = 59 WN = 5,275	($\underset{\sim}{P}$ = .000) P = .060 N = 45 WN = 5,737	($\underset{\sim}{P}$ = .109) P = .025 N = 71 WN = 95,136	(1) $p < .01$ (2) $p < .01$
Two Year Academic Program	($\underset{\sim}{P}$ = .178) P = .178 N = 165 WN = 13,743	($\underset{\sim}{P}$ = .151) P = .128 N = 100 WN = 10,913	($\underset{\sim}{P}$ = .149) P = .135 N = 173 WN = 209,091	(1) NS (2) NS
Four Year or Greater Academic Program	($\underset{\sim}{P}$ = .247) P = .247 N = 718 WN = 57,775	($\underset{\sim}{P}$ = .238) P = .260 N = 236 WN = 21,817	($\underset{\sim}{P}$ = .188) P = .219 N = 302 WN = 458,243	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two a priori contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Cell sizes in this row were sufficiently small to ensure that within stratum assumptions of the analytic model are violated; therefore, results should be viewed with extreme caution.

Table H.66

Rates of Academic Dismissal
As a Function of Upward Bound Participation Pattern
And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	(P = .000) $\tilde{P}$ = .000 N = 59 WN = 5,275	(P = .051) $\tilde{P}$ = .070 N = 45 WN = 5,737	(P = .107) $\tilde{P}$ = .147 N = 71 WN = 95,136	(1) NS (2) NS
Two Year Academic Program	(P = .058) $\tilde{P}$ = .058 N = 165 WN = 13,743	(P = .073) $\tilde{P}$ = .074 N = 100 WN = 10,913	(P = .005) $\tilde{P}$ = .010 N = 173 WN = 209,091	(1) NS (2) NS
Four Year or Greater Academic Program	(P = .095) $\tilde{P}$ = .095 N = 718 WN = 57,775	(P = .079) $\tilde{P}$ = .083 N = 236 WN = 21,817	(P = .066) $\tilde{P}$ = .060 N = 302 WN = 458,243	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Cell sizes in this row are sufficiently small to ensure that within stratum assumptions of the analytic model are violated; therefore, results should be viewed with extreme caution.

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Table H.67

Average Number of Earned Postsecondary Credits As a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	(M = 30.0) $\tilde{M}$ = 30.0 N = 29 WN = 2,586	(M = 39.4) $\tilde{M}$ = 38.1 N = 18 WN = 2,094	(M = 38.9) $\tilde{M}$ = 48.8 N = 28 WN = 58,760	(1) NS (2) NS
Two Year Academic Program	(M = 38.9) $\tilde{M}$ = 38.9 N = 163 WN = 14,247	(M = 36.7) $\tilde{M}$ = 39.5 N = 100 WN = 12,297	(M = 31.3) $\tilde{M}$ = 31.5 N = 172 WN = 223,065	(1) NS (2) NS
Four Year or Greater Academic Program	(M = 101.4) $\tilde{M}$ = 101.4 N = 700 WN = 58,664	(M = 102.5) $\tilde{M}$ = 101.9 N = 232 WN = 23,644	(M = 103.8) $\tilde{M}$ = 105.9 N = 296 WN = 464,650	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants; the data were trimmed by excluding cases with suspect values (i.e., more than 220 earned credits). Four entries are provided in each cell: (1) raw weighted means, M (in parentheses), (2) adjusted weighted means, $\tilde{M}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), and (3) cell size, N, and (4) total cell weight, WN.

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[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two *a priori* contrasts were formed from the adjusted means within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Cell sizes in this row are sufficiently small to ensure that within stratum assumptions of the analytic model are violated; therefore, results should be viewed with extreme caution.

Table H.68

Average Credits Earned Relative to Credits Expected Under Normal Progression As a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a/]	Upward Bound Participation Pattern[b/]			Significance Level Of Contrasts[c/]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d/]	(M = .306) $\tilde{M}$ = .306 N = 29 WN = 2,586	(M = .331) $\tilde{M}$ = .307 N = 18 WN = 2,094	(M = .367) $\tilde{M}$ = .410 N = 29 WN = 59,564	(1) NS (2) NS
Two Year Academic Program	(M = .310) $\tilde{M}$ = .310 N = 163 WN = 14,247	(M = .273) $\tilde{M}$ = .291 N = 100 WN = 12,297	(M = .271) $\tilde{M}$ = .259 N = 171 WN = 221,839	(1) NS (2) NS
Four Year or Greater Academic Program	(M = .575) $\tilde{M}$ = .575 N = 716 WN = 59,960	(M = .584) $\tilde{M}$ = .578 N = 236 WN = 24,076	(M = [illegible]536) $\tilde{M}$ = [illegible]596 N = 302 WN = 481,068	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants. The variable representing credits earned relative to normal progression is defined in Appendix F; these data were trimmed by excluding cases with suspect values (i.e., values of the variable greater than 1.5). Four entries are provided in each cell: (1) raw weighted means, M (in parentheses), (2) adjusted weighted means, $\tilde{M}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a/] Excluding graduate study.

[b/] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c/] Two *a priori* contrasts were formed from the adjusted means within each row: (1) column one versus column two, and (2) column one versus column three.

[d/] Cell sizes in this row are sufficiently small to ensure that within stratum assumptions of the analytic model are violated; therefore, results should be viewed with extreme caution.

Table H.69

Postsecondary Graduation Rates as a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	(P = .286) $\tilde{P}$ = .286 N = 90 WN = 6,394	(P = .528) $\tilde{P}$ = .498 N = 78 WN = 6,965	(P = .487) $\tilde{P}$ = .428 N = 134 WN = 128,314	(1) NS (2) NS
Two Year Academic Program	(P = .085) $\tilde{P}$ = .085 N = 216 WN = 14,752	(P = .104) $\tilde{P}$ = .091 N = 135 WN = 10,547	(P = .102) $\tilde{P}$ = .051 N = 223 WN = 207,718	(1) NS (2) NS
Four Year or Greater Academic Program	(P = .182) $\tilde{P}$ = .182 N = 846 WN = 55,761	(P = .186) $\tilde{P}$ = .186 N = 286 WN = 21,056	(P = .098) $\tilde{P}$ = .136 N = 372 WN = 426,089	(1) NS (2) NS

NOTE: These analyses were conducted for PSE entrants only. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two a priori contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Small cell sizes in this row led to insufficient data for within stratum estimates in some strata; therefore, results should be viewed with caution.

Table H.70

Proportion of Four-Year College Graduates Entering Graduate Study As a Function of Upward Bound Participation Pattern

Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
Typical	Atypical	Nonparticipant	
($\underset{\sim}{P}$ = .089) P = .089 N = 148 WN = 8,079	($\underset{\sim}{P}$ = .159) P = .150 N = 54 WN = 3,311	($\underset{\sim}{P}$ = .090) P = .117 N = 27 WN = 31,481	(1) NS (2) NS

NOTE: These analyses were restricted to the twelfth-grade cohort and to those individuals who had entered PSE and graduated from a four-year institution. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\tilde{P}$ (adjusted within row for sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN. Cell sizes are sufficiently small to ensure that within stratum assumptions of the analytic model are violated; therefore, results should be viewed with extreme caution.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two a priori contrasts were formed from the adjusted proportions: (1) column one versus column two, and (2) column one versus column three.

Table H.71

Postsecondary Educational Progress Relative to Goals As a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering of Institution Last Attended[a]	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
	Typical	Atypical	Nonparticipant	
Two Year or Less Vocational, Trade, or Business School[d]	($\underset{\sim}{M}$ = 41.0%) M = 41.0% N = 85 WN = 7,610	($\underset{\sim}{M}$ = 34.6%) M = 34.4% N = 72 WN = 9,437	($\underset{\sim}{M}$ = 40.2%) M = 32.5% N = 119 WN = 168,348	(1) NS (2) NS
Two Year Academic Program	($\underset{\sim}{M}$ = 55.8%) M = 55.8% N = 197 WN = 16,664	($\underset{\sim}{M}$ = 54.3%) M = 53.8% N = 130 WN = 14,375	($\underset{\sim}{M}$ = 48.1%) M = 50.0% N = 203 WN = 336,454	(1) NS (2) NS
Four Year or Greater Academic Program	($\underset{\sim}{M}$ = 56.4%) M = 56.4% N = 765 WN = 60,490	($\underset{\sim}{M}$ = 56.3%) M = 55.0% N = 254 WN = 26,427	($\underset{\sim}{M}$ = 56.2%) M = 58.1% N = 342 WN = 562,354	(1) NS (2) NS

NOTE: These analyses were restricted to PSE entrants; the variable reported is actual postsecondary progress expressed as a percentage of progress necessary to achieve reported educational goal (see Appendix E). Four entries are provided in each cell: (1) raw weighted means, $\underset{\sim}{M}$ (in parentheses), (2) adjusted weighted means, $\bar{M}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Excluding graduate study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Two *a priori* contrasts were formed from the adjusted means within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Small cell sizes in this row led to insufficient data for within stratum estimates in some strata; therefore, results should be viewed with caution.

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Table H.72

Rates of Attending Four-Year Institutions Within Twelfth-Grade Cohort As a Function of Upward Bound Participation Pattern

Upward Bound Participation Pattern[a]			Significance Level Of Contrasts[b]
Typical	Atypical	Nonparticipant	
(P = .743)	(P = .654)	(P = .533)	(1) $p < .05$
$\underset{\sim}{P}$ = .743	$\underset{\sim}{P}$ = .658	$\underset{\sim}{P}$ = .426	(2) $p < .01$
N = 610	N = 235	N = 285	
WN = 39,113	WN = 16,076	WN = 229,326	

NOTE: These analyses were restricted to PSE entrants in the twelfth-grade cohort. Four entries are provided in each cell: (1) raw weighted proportions, P (in parentheses), (2) adjusted weighted proportions, $\underset{\sim}{P}$ (adjusted within row for sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group), (3) cell size, N, and (4) total cell weight, WN.

[a] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[b] Two *a priori* contrasts were formed from the adjusted proportions within each row: (1) column one versus column two, and (2) column one versus column three.

Table H.73

Postsecondary Educational Progress of Twelfth-Grade Cohort As a Function of Upward Bound Participation Pattern And Level of Offering of Institution Last Attended

Level of Offering Of School Last Attended[a]	Postsecondary Educational Progress[b]	Upward Bound Participation Pattern[c]			Significance Level Of Contrasts[d]
		Typical	Atypical	Nonparticipant	
Two Years Or Less[e]	Less Than One Year's Credit	(P = .644) $\tilde{P}$ = .644	(P = .711) $\tilde{P}$ = .812	(P = .515) $\tilde{P}$ = .738	(1) NS (2) NS
	One Year's Credit Or More	(P = .214) $\tilde{P}$ = .214	(P = .176) $\tilde{P}$ = .135	(P = .266) $\tilde{P}$ = .166	(1) NS (2) NS
	Graduated	(P = .142) $\tilde{P}$ = .142	(P = .113) $\tilde{P}$ = .053	(P = .219) $\tilde{P}$ = .096	(1) NS (2) NS
	Number of Cases	91	39	70	
	Total Weight	8,147	3,805	73,841	
Four Years	Less Than One Year's Credit	(P = .239) $\tilde{P}$ = .239	(P = .284) $\tilde{P}$ = .272	(P = .146) $\tilde{P}$ = .101	(1) NS (2) $p < .05$
	One to Two Years' Credit	(P = .175) $\tilde{P}$ = .175	(P = .162) $\tilde{P}$ = .164	(P = .139) $\tilde{P}$ = .102	(1) NS (2) NS
	Two to Three Years' Credit	(P = .112) $\tilde{P}$ = .112	(P = .084) $\tilde{P}$ = .121	(P = .236) $\tilde{P}$ = .308	(1) NS (2) NS
	Three Years' Credit or More	(P = .173) $\tilde{P}$ = .173	(P = .134) $\tilde{P}$ = .112	(P = .220) $\tilde{P}$ = .317	(1) NS (2) $p < .05$
	Graduated	(P = .301) $\tilde{P}$ = .301	(P = .335) $\tilde{P}$ = .332	(P = .259) $\tilde{P}$ = .172	(1) NS (2) NS
	Number of Cases	353	120	109	
	Total Weight	29,695	11,897	145,134	

NOTE: These analyses were restricted to PSE entrants in the twelfth-grade cohort. Two entries are provided in each cell: (1) raw weighted column proportions within major level-of-offering breakdown, P (in parentheses), and (2) adjusted weighted column proportions $\tilde{P}$ (adjusted within row for grade, sex, race, poverty status, academic risk status, and over age in grade characteristics of the typical UB participation group).

[a] Excluding any graduate training.

[b] One term's credit was determined as the equivalent of 45 quarter hours or 30 semester hours.

[c] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[d] Two *a priori* contrasts were formed from the adjusted column proportions or means within each row: (1) column one versus column two, and (2) column one versus column three.

[e] Cell sizes within this level-of-offering breakdown are sufficiently small to ensure that within stratum assumptions of the analytic model are violated; therefore, results should be viewed with extreme caution.

Appendix I

Procedures and Results of Relational Analyses

Appendix I

Procedures and Results of Relational Analyses

I. INTRODUCTION

This appendix addresses the relational analyses leading to the findings reported in Chapter 4 of the report. Specifically emphasized are: (a) the general analytic approach and rationale, (b) constraints and limitations on the analyses, (c) specific approaches to model building and testing, (d) analytic procedures employed, and (e) supporting tabular results. Topics that are closely related to these analyses are detailed elsewhere: weighting adjustments in Appendix G and analysis variable construction in Appendix E.

Although the comparative/descriptive analyses, described in Appendix H and reported in Chapter 3, address important questions of national impact of the Upward Bound (UB) program, there are other obviously important questions concerning the program and its possible impact at a less global level. Specifically, there is a need for a comprehensive approach to analysis in which student outcomes are examined in relation to the student characteristics (e.g., age, sex, ethnicity, poverty status, academic risk status), and grade level or contextual influences (e.g., use of PSE services, financial aid, institutional setting), as well as to the pattern of UB participation. The comparative/descriptive analyses suggested that differences in PSE outcomes among UB participants and nonparticipants may be explained through intervening factors of the PSE experience; however, the statistical procedures used did not permit simultaneous adjustment for a large number of intervening factors.

The relational analyses, which were conducted for a subset of outcome variables, represent an attempt to provide a comprehensive examination, through the formulation of a model of PSE outcomes and the examination of the relationships among the elements of that model. This modeling approach, embodied in recently developed techniques collectively known as analysis of covariance structures, provided a better means to exploit the multivariate nature of the data and to examine the complex structure of relationships among key variables. In general, this approach implies questions related to a fuller understanding of the PSE environments within which UB participants and nonparticipants are placed.

These analyses start with a model of how various data elements relate to each other over time, i.e., a model of directional relationships. Within the adopted model, directional prediction paths are specified for all elements, and the overall relationship ("effect") between two variables is decomposed into (a) a part that operates through intermediate variables, indirect effects, and (b) a residual part that cannot be attributable to intermediate factors, the direct effect. Thus, some portion of total relationship is due to relationships through other variables and the remaining portion represents the direct relationship that is not otherwise explained.

The technique is particularly suited to the longitudinal nature of this study, but is less well suited to the underlying sample methodology. While the developed model is convenient in explaining the data and intuitively appealing, there are probably other models that could fit the data as well or better. Moreover, the technique used required considerably more assumptions than the hypothesis-testing approach, and results must be considered exploratory and should be interpreted with considerable caution.

The remaining sections of this appendix provide greater detail concerning the procedures used and results of this set of exploratory analyses. Section II presents general analytic and modeling considerations. Section III details the specific analytic technique used, and Section V provides details of additional methodological procedures that were implemented in the specific application of the analytic technique to the current study. Section V provides a discussion of the several constraints and limitations of these analyses. Section VI presents major analytic results in tabular form.

II. GENERAL CONSIDERATIONS

A. Analytic Considerations

Perhaps the most widely known technique of structural equation approaches is path analysis,[1] which has been described as "a method for studying the direct and indirect effects of variables taken as causes on variables taken as effects."[2] The procedure used in these analyses is quite similar to path analyses, but but actually represents a more general procedure developed for analysis of covariance structures.[3] The use of the terms "causes" and "effects" is somewhat misleading since the approaches do not examine cause in a metaphysical sense but investigate potential causation in a predictive or explanatory sense.

Application of the approach is in testing a model of directional relationships, formulated on the basis of prior knowledge and/or theoretical considerations. Thus, structural equation models (and solutions) involving the same constructs can vary with the tenets of the particular theoretical framework adopted. Moreover, the inclusion or exclusion of particular variables from the model can change solutions dramatically. Analytic solutions indicate whether the model examined is plausible (not necessarily the most plausible) and, the nature of the relationships within the assumed model. Thus, the techniques are directed toward examining data within a particular theory of behavior rather than in generating such theory.

Structural equation approaches investigate both the direct and indirect effects of predictor variables on criterion variables, in contrast to standard regression analysis, which assesses only the simultaneous direct unique relationships of variables to an outcome. The different types of effects are determined through a decomposition of the overall relationship of one variable to another into (a) the indirect effect, the part that operates only through other intermediate varables in the model, and (b) the direct effect, the residual portion of the relationship that is unique (i.e., does not operate through intermediate variables). Thus, within the adopted model, it is assumed that some of the overall relationship of one variable to another is due to relationships (links) that exist with other variables that intervene and a residual portion of the relationship that cannot be explained through the intervening variables.

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[1] See Duncan, O. D., Introduction to Structural Equation Models. New York: Academic Press, 1975.

[2] Kerlinger, F. N. and E. J. Pedhazur, Multiple Regression in Behavioral Research. New York: Holt, Rinehart & Winston, 1973.

[3] Jöreskog, K. G. A General Method for Analysis of Covariance Structures, Biometrika, 57(2), 1970, p. 239-251.

Structural models can be expressed by means of directional paths interrelating the sets of variables considered, and solutions typically yield coefficients associated with these paths, which may be interpreted in a similar manner to regression coefficients. The coefficient associated with the path that leads directly from a variable of interest to the criterion variable considered represents the direct effect portion of the relationships, while the sum of the products of the coefficients associated with paths that lead through intervening variables may be taken as the indirect effect.

B. Modeling Considerations

The model examined through structural equation approaches should be based in theory, since the posited model is thereafter assumed to be the only representation of the structural interrelationships that is considered. This implies, of course, that all results are conditional on the model that has been assumed. Several models were considered, in light of their theoretical soundness, the availability and scale properties of key variables, and potential technical problems. The nature of the model finally adopted is depicted in Figure I.1.

The adopted model posits specific directional relationships (paths) among the elements; the direction of a relationships is indicated by an arrow. Two sets of variables are taken as starting points for prediction: UB participation pattern and background characteristics. These starting-point variables are called exogenous variables. Relationships are assumed to exist between the two classes of exogenous variables and among the exogenous variables within each set. There is, however, no clearcut directionality among the exogenous variables on the basis of theory; thus, no direction is assumed for the relationships.

Both of the exogenous variable sets are considered to predict subsequent variable sets within the model, which are called endogenous variables. As indicated in Figure I.1, additional prediction is allowed among the ordered endogenous variable sets. The directionality of prediction indicated in the figure represents a major modeling assumption.

The first prediction link is to the set of variables representing PSE context factors. The next prediction links in the model are to the set of variables representing use of support services. This implies that the institutional context predicts service usage. Thus, prediction of service use variables is assumed from UB participation pattern, background characteristics, and from PSE context factors. Indirect effects on service use may exist through PSE context factors (e.g., the relationship between UB participation pattern and use of support services may be partially explained through the relational link of UB participation to PSE context factors and the subsequent link of context factors to use of services). The class of financial aid variables is modeled as related to all previously considered factors, and PSE success outcomes are assumed to be related to all other elements in the model.

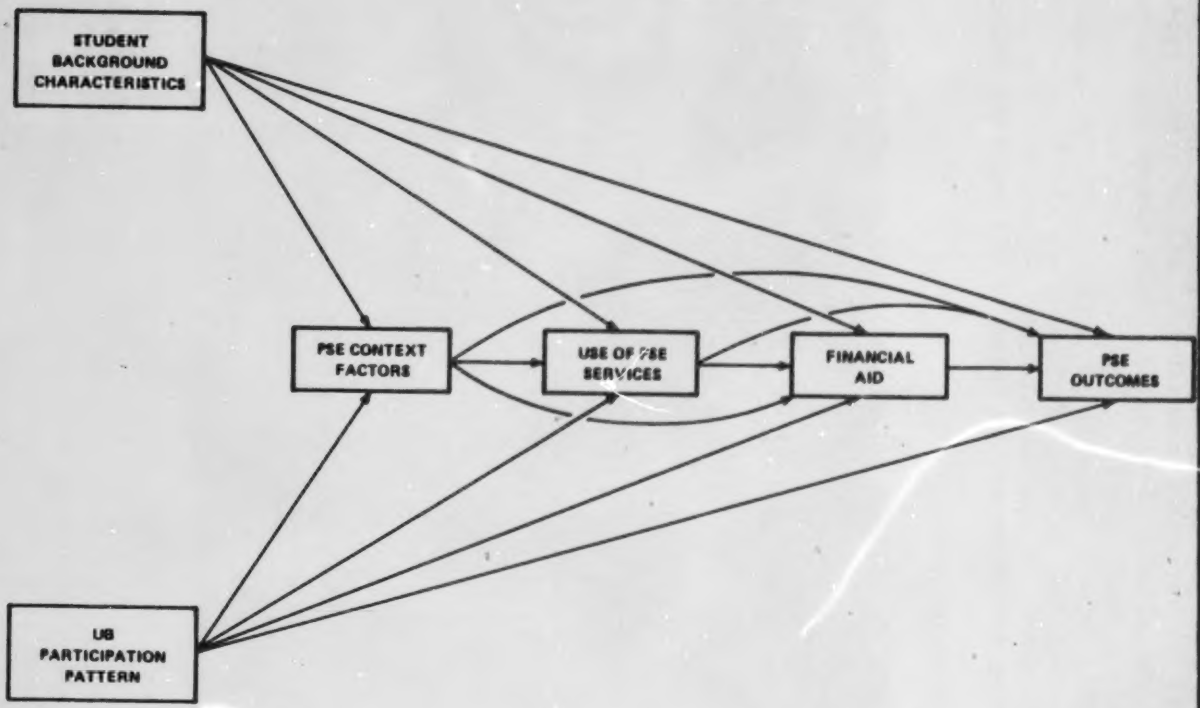
STUDENT BACKGROUND CHARACTERISTICS
PSE CONTEXT FACTORS
USE OF PSE SERVICES
FINANCIAL AID
PSE OUTCOMES
UB PARTICIPATION PATTERN

Figure I.1 General form of the adopted theoretical model of PSE outcomes.

Even within the simplified conceptual model presented in Figure 16, there are 11 potential direct effects and 22 potential indirect effects; however, most of the elements in the simplified model represent more than one variable. Thus, the actual model considered represented a much more complex structure of relationships. For the 24 variables that were considered (see Section IV), the number of potential direct and indirect effects was greatly increased. Since each variable set indicated in Figure I.1 represents more than one variable, it was also necessary to model the relationships among variables within each set. Directionality within a set typically was neither theoretically nor logically indicated, and such relationships were modeled as nondirectional, allowing the necessary existence of the relationships but introducing links through which indirect effects could operate that were quite difficult to interpret. Regardless of the complexity, however, the basic assumptions of the model (e.g., use of PSE services precedes and thus directionally predicts receipt of financial aid and PSE success measures) are defined by Figure I.1.[4]

III. THE ANALYTIC MODEL

The analysis of linear structural relationships by the method of maximum likelihood is an approach to the analysis of the interrelationships among variables which has been under development by Karl Jöreskog and others over the past decade.[5] The purpose of the approach is to permit the estimation of parameters in models relating a set of exogenous variables to a set of endogenous variables within which additional relationships may be of interest. With the proper restrictions, this approach will yield the same results as an estimation of path coefficients through the use of regression analysis, an approach widely used by sociologists.[6] The approach can also be used appropriately where variable measurement is fallible, a situation in which regression analysis yields biased estimates of parameters. Given multiple measures of each fallibly measured variable, the method will even permit the simultaneous estimation of factor loadings, measurement error, and the interrelationships among exogenous and endogenous latent variables. In this sense, the method permits investigators to explore more characteristics of their constructs than other avaiable methods.

Since multiple measures of the variables of interest were not readily available, the present application of this method does not make use of the factor analytic feature; however, in the second set of relational analyses considered, estimates of error variance associated with each measure were drawn from other components of the study to permit an investigation of interrelationships among the latent variables represented by the measures.

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[4] To the extent that these basic assumptions are invalid, results may represent little more than the end product of a computational exercise.

[5] For additional references to work in this area, see Jöreskog, K. G. and Sörbom, D. LISREL: Analysis of Linear Structural Relationships by the Method of Maximum Likelihood, User's Guide (Version IV, Release 2). Chicago, Ill.: National Educational Resources, Inc., November 1978.

[6] Duncan, O. D. (*op. cit.*)

A. The Basic Model Without Measurement Error

Since the sufficient statistic for the use of this method is the variance-covariance matrix among the complete set of exogenous and endogenous variables, the simplest statement of the model is in terms of this matrix. Given both exogenous and endogenous variables, it is convenient to partition the overall variance-covariance matrix among the variables as follows:

$$\Sigma = \left[\begin{array}{c|c} \Sigma_{yy} & \Sigma_{yx} \\ \hline \Sigma_{xy} & \Sigma_{xx} \end{array}\right]$$

where

Σ_{yy} is the variance-covariance matrix among the endogenous variables,

Σ_{xx} is the variance-covariance matrix among the exogenous variables,

and $\Sigma_{yx} = \Sigma_{xy}'$ is the variance-covariance matrix between the exogenous and endogeous variables.

For the model involving no measurement error, each of these components can be expressed in terms of simpler parameter matrices, estimates of which are of practical interest. Using the notational scheme employed by Jöreskog the parameterized expression for the overall variance-covariance matrix can be expressed as:

$$\Sigma = \left[\begin{array}{c|c} \beta^{-1}(\Gamma\,\Phi\,\Gamma' + \Psi)\beta^{-1'} & \beta^{-1}\,\Gamma\,\Phi \\ \hline \Phi\,\Gamma'\,\beta^{-1'} & \Phi \end{array}\right],$$

where

Φ is the variance-covariance matrix among the exogenous variables,

Γ is a matrix of coefficients relating the exogenous to the endogeous variables,

β is a matrix of coefficients relating the endogenous variables to one another, and

Ψ is a matrix representing the residual variance-covariance matrix among the endogenous variables unaccounted for by the exogenous variables.

The model may be more easily understood in terms of a simple example. Assume two exogenous variables (x_1 and x_2) and two endogenous variables (y_1 and y_2). A simple path diagram representing interrelationships among these variables could be expressed as shown in Figure I.2. In this particular model, the exogenous variables, x_1 and x_2, are seen as mutually interrelated predictors of the first endogenous variable, y_1. The latter variable, in concert with the exogenous variables, is seen as predicting the second endogenous variable, y_2. The coefficient parameter matrices in this case would be:

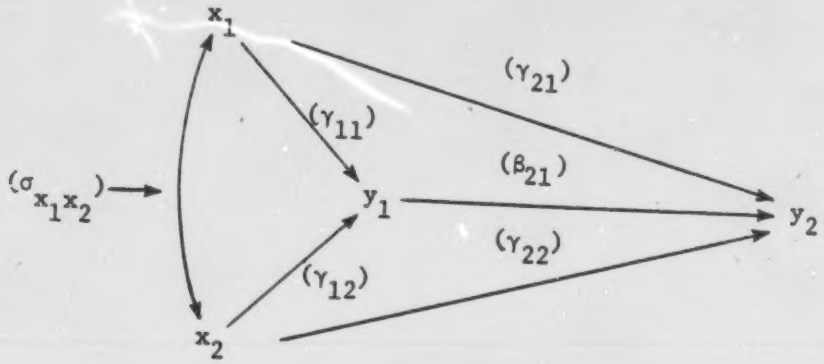

Figure I.2. Hypothetical Model 1.

$$\Gamma = \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix}, \qquad \beta = \begin{bmatrix} 1 & 0 \\ -\beta_{21} & 1 \end{bmatrix}.$$

The remaining matrices would be defined as:

$$\Phi = \begin{bmatrix} \sigma_{x_1}^2 & \sigma_{x_1x_2} \\ \sigma_{x_2x_1} & \sigma_{x_2}^2 \end{bmatrix}, \qquad \Psi = \begin{bmatrix} r_{y_1}^2 & r_{y_1y_2} \\ r_{y_2y_1} & r_{y_2}^2 \end{bmatrix},$$

where $\sigma_{x_1}^2$ and $\sigma_{x_2}^2$ are the variances for x_1 and x_2 respectively,

$\sigma_{x_1x_2} = \sigma_{x_2x_1}$ is the covariance among x_1 and x_2,

$r_{y_1}^2$ and $r_{y_2}^2$ are the residual variances for y_1 and y_2, and, finally,

$r_{y_1y_2} = r_{y_2y_1}$ is the residual covariance among y_1 and y_2.

A very powerful aspect of the approach is that parameters can be constrained equal to zero, thereby permitting the estimation of simpler models such as the one shown in Figure I.3. Here the x's no longer directly influence y_2, but operate indirectly through y_1. Using a likelihood ratio approach, the "fit" of Model 2 can be compared statistically with that of Model 1. The absence of a significant difference would imply that Model 2 is as statistically valid as Model 1. Given the assumed a priori directionality among the x's and the y's, this result could be taken as supporting an interpretation that x_1 and x_2 predict y_1, which, in turn, is the sole direct predictor of y_2 (i.e., all prediction of y_2 by x_1 or x_2 is indirect through y_1). Of course, other simplifications of Model 1 are possible.

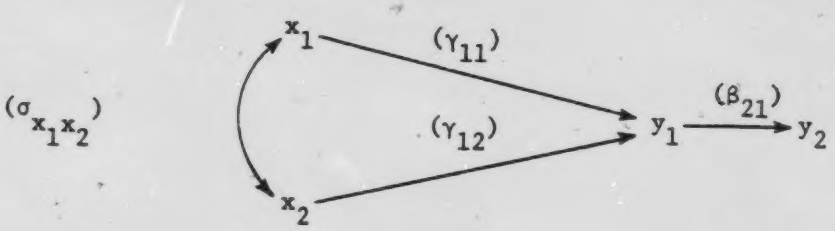

Figure I.3. Hypothetical Model 2.

B. The Model with Measurement Error

Given known measurement error for the variables employed, the resulting model may be expressed as:

$$\Sigma = \left[\begin{array}{c|c} \beta^{-1}(\Gamma\,\Phi\,\Gamma' + \Psi)\beta^{-t} + \Theta_\varepsilon & \beta^{-1}\,\Gamma\,\Phi \\ \hline \Phi\,\Gamma'\,\beta^{-t} & \Phi + \Theta_\omega \end{array}\right],$$

where Θ_ε and Θ_ω are diagonal matrices containing the estimated error variance associated with the endogenous and exogenous variables, respectively. This is a more general model, which reduces to the previous case when $\Theta_\varepsilon = 0$ and $\Theta_\omega = 0$ (i.e., no measurement error). Under these circumstances, however, the meaning of the other parameter matrices is somewhat changed, as follows:

Φ is the variance-covariance matrix of the "true" values of the exogenous variables,

Γ is a matrix of coefficients relating the "true" values of the exogenous variables to the "true" values of the endogenous variables,

β is a matrix of coefficients relating the "true" values of the endogenous variables to one another, and

Ψ is the variance-covariance matrix of the residual "true" values of the endogenous variables.

The estimated coefficients in Γ and β, therefore, refer to the interrelationships among the latent variables and not the fallibly measured observed variables.

In terms of Models 1 and 2 discussed above, the inclusion of the measurement error components generates the modified path models shown in Figures I.4 and I.5. In the modified models, ω_1 and ω_2 refer to the measurement error in x_1 and x_2 respectively, ε_1 and ε_2 refer to the measurement error in y_1 and y_2 respectively, and the other coefficients (not shown) are represented as previously indicated.

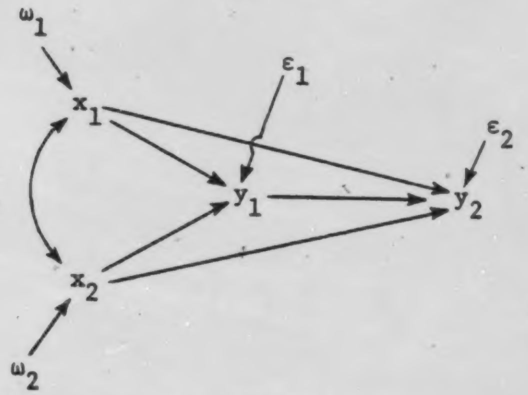

Figure I.4. Modified hypothetical Model 1.

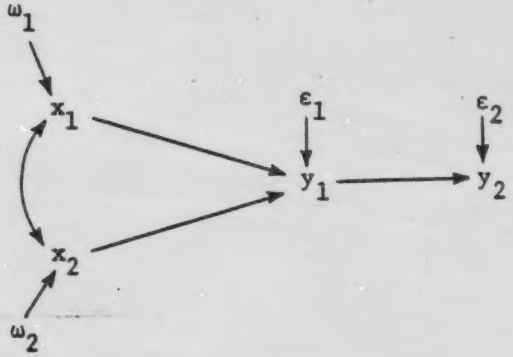

Figure I.5. Modified hypothetical Model 2.

C. Parameter Estimation, Model Testing, and Standard Errors

Given a variance-covariance matrix and a model containing parameters to be estimated, the approach generates estimates for which the likelihood of the observed variance-covariance matrix is maximized under the assumption that the underlying data is distributed multivariate-normal. Standard errors for the estimated parameters are produced by evaluating the negative inverse of the information matrix at the estimates. The square roots of the diagonal values of the resulting matrix provide asymptotic standard errors for the estimates.

An overall statistical test of fit of a given model is obtained by taking the ratio of the likelihood under the estimated model to the likelihood under a completely unrestricted model where Σ is estimated by the observed variance-covariance matrix. For large samples and under the null nypothesis that the estimated model fits the data, this statistic is distributed as chi-square. A parallel procedure can be employed to statistically evaluate the fit of one estimated model as compared to that of another.

IV. SPECIFIC ANALYTIC PROCEDURES

The specific software used in solving the posited structural model was the LISREL program.[7] This software is particularly applicable to the present problem. First, the general procedure allows for the posited nondirectional relationships within the separate classes of intervening variables, which cannot be accomodated by many approaches to the problem. Second, the procedure allows investigation of differential variable reliability (which is suggested for the data used), another feature that cannot be accomodated by simpler regression approaches.

To implement both the general procedure and the specific software, detailed decisions were necessary regarding the exact nature of the modeling, weighting, and variables. Moreover, within the developed model, specific approaches to the solutions reported in Chapter 4 of the report were not always completely straightforward. A description of these study-specific procedures is provided in the subsections that follow.

A. Additional Modeling

Most of the modeling was relatively uncomplicated. Paths were allowed from all variables in the variable sets defined in Figure I.1 to all variables in subsequent sets, which defined the matrices Γ and β (described in Section III). While nondirectional relationships among the exogenous variables were easily incorporated in the matrix Φ, the nondirectional relationships of endogenous variables within the same variable set were more problematic. Most structural equation approaches require specification of directionality for all endogenous variables (which would allow the relationships to be represented in β); however, in most cases no directionality within variable set could be specified, for the model considered here.

These nondirectional relationships among endogenous varibles were allowed to be represented in the matrix Ψ, which contains residual variances and covariances among the endogenous variables. Under typical modeling the covariance of errors of prediction would be constrained to zero (i.e., Ψ is usually a diagonal matrix), but the representation used here allowed the nondirectional relationships to be represented through correlated errors of prediction. This representation is considered theoretically sound, but introduced some problems in interpretation (see below, Subsection IV.E).

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[7] Jöreskog, K. G. and Sörbom, D., November 1978 (*op. cit.*)

For the variable set involving financial aid elements, directionality of the relationships among the variables was assumed on the basis of a model recommended by USOE,[8] which was of sufficient intuitive appeal to warrant consideration. In this modeling, the amount of grant received (as rescaled to account for differential institutional costs) was taken as the primary form of financial aid, on which receipt or use of other financial aid elements depended. The modeling assumed that, given receipt of some amount of grant/scholarship funds, the next source of aid sought was loans and, following that, earnings or savings were used to round out the financial aid package. These directional relationships were incorporated into the matrix β.

For modeling involving differential reliabilities, another problem occurred in representing measurement error in the matrices Θ_ε and Θ_ω, and associated problems in modeling the diagonal elements of Φ. Since multiple measures of the variables were not available, the program could not provide these estimates directly; rather, the values had to be obtained from other study components. Where reliability (r) estimates were available, error variances (s_e^2) were computed from observed variances (s_o^2) through the well-known result of classical test theory:

$$s_e^2 = (1 - r)\, s_o^2.$$

Where reliability estimates were not available, the values of error variance used were determined jointly by RTI and USOE, based on available information and subjective estimates. Given estimates of error variance, the true score variance (s_t^2) estimates for Φ were obtained from another result of test theory:

$$s_t^2 = s_o^2 - s_e^2.$$

B. Weighting

Weighting of the data for analysis posed particularly difficult problems. A large number of technical problems were introduced through attempts to use sampling weights, as adjusted. Former UB participants and nonparticipants were represented by markedly different sampling weight sums (reflecting the markedly different sizes of the populations from which they were drawn). Moreover, there were known differences between the former participant and nonparticipant groups in the distributions of background factors (see Table H.1 in Appendix H). While the background factors were incorporated into the analytic model, the differential distributions coupled with the weight differentials could have resulted in relationships among exogenous and endogenous variables that were determined almost exclusively by the relationships existing in the nonparticipant group.

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[8] The directionality assumed was similar to that investigated by Carroll. See Carroll, C. D. Packaging of Financial Aid for First-Time, Full-Time Dependent Freshmen in 1978. Technical Paper 79-13. Washington, D.C.: Office of Evaluation and Dissemination, U.S. Office of Education, August 3, 1979.

To overcome this problem, RTI and USOE agreed upon a weighting procedure that was unrelated to sampling rates. The approach used was based on a desire to create a quasiexperimental situation in whch outcomes could be modeled for two more-or-less equivalently sized groups with analogous distributions of background factors. Since individuals for whom the entire set of modeling variables was not available (i.e., item nonresponse problems) could not be used in the analyses, the weighting was performed only for the subset of individuals with complete data. The procedure was a technique whereby two artificial groups were constructed such that the nonparticipant group would be similar to the UB participant group on relevant student background variables (sex, race, poverty status, academic risk status, and initial grade cohort distribution) and in total group size. In essence, the procedure forced a greater similarity between the two groups in terms of the background characteristics that are theoretically related to outcomes but that were not completely controlled by the study design.

This adjustment procedure (a form of partial balancing) was used exclusively for the relational analyses, and is detailed in Appendix G. It should be noted that the balancing procedure used in this study (like that used in previous studies) only attempted adjustment for two groups--former participants and nonparticipants. Adjustment within the former participant group on the basis of participation pattern was not attempted. Resulting distributions of background characteristics for former participants and nonparticipants using these weights are given in Table I.1. The procedure was not completely successful; it overadjusted the nonparticipant group for poverty status, race, and size. On other factors, however, the procedure produced comparable marginal frequencies for the variables considered.

C. Variable Construction

The analytic approach is predicated on the use of continuous variables with at least interval scale properties; however, many of the raw variables were categorical and others represented only an ordinal scaling. The nature of the variables constructed for analysis was determined jointly by RTI and USOE and, while not perfect, represents an attempt to produce the most meaningful analytic variables from the available data.

Each of the classes of variables shown in Figure 16 was represented in the full model by one or more variables. Those variables that were categorical in nature were coded as (0,1) variables to be more amenable to relational analysis, yielding a base group (coded 0) and a predictor group (coded 1). In this case, resulting coefficients reflect the effect associated with the predictor group relative to the base group (e.g., the effect associated with being female rather than male). Some categorical variables represent three classes and must be dealt with differently. The approach used in this case was dummy coding, which creates two related dichotomies, in which case the group coded 0 in both dichotomies was the base group. Although some assumptions are violated in using such variables, the procedure is commonly used and generally acceptable.

All participation pattern variables and background variables were represented by a recoding of categorical raw variables. The resulting analytic variables are defined in Table I.2. Base groups for these variables are obvious from the coding. The five PSE contextual factors were coded or scaled

Table I.1

Demographic Characteristics of the Relational Analysis Subgroup After Partial Balancing As a Function of Upward Bound Participation Pattern

Variable[a]	Classification	Upward Bound Participation Pattern[b]			Significance Level Of Contrasts[c]
		Typical	Atypical	Nonparticipant	
Sex[d]	Male	.445	.410	.367	(1) NS
	Female	.555	.590	.623	(2) NS
Age Within Grade[d]	Not Over Age In Grade	.931	.893	.898	(1) NS (2) NS
	Over Age In Grade	.069	.107	.102	
Poverty Status[d]	Poverty Level	.765	.628	.866	(1) p < .01
	Not Poverty Level	.235	.372	.134	(2) p < .01
Academic Risk Status[d]	Risk	.367	.341	.465	(1) NS
	Not Risk	.633	.659	.535	(2) NS
Race	Black	.721	.567	.770	(1) p < .01 (2) NS
	White	.117	.234	.071	(1) p < .01 (2) p < .05
	Other	.162	.199	.159	(1) NS (2) NS
Grade Cohort[e]	10th Grade	.104	.134	.109	(1) NS (2) NS
	11th Grade	.401	.402	.405	(1) NS (2) NS
	12th Grade	.495	.464	.486	(1) NS (2) NS
Number of Cases		656	261	376	
Weight Total		8,528	3,393	16,542	

NOTE: Cell entries are weighted column proportions within major variable categories, based on equal weights for former participants and with nonparticipant weights partially balanced on marginal distributional differences in the unweighted participant and nonparticipant groups, and further adjusted to obtain more equivalent group sizes. All adjusted weights were multiplied by a constant of 13 to ensure that no weight would be less than 1.

[a] These variables determined during base year study.

[b] Typical UB participation pattern is defined as those participating in grades 10, 11, and 12 or in grades 11 and 12; the atypical pattern category includes all other patterns of UB participation.

[c] Unless otherwise indicated, two _a priori_ contrasts were formed from the column proportions within each row: (1) column one versus column two, and (2) column one versus column three.

[d] Only one set of contrasts is reported for this variable, since the contrasts for each of the two classifications of the variable are completely redundant.

[e] Represents grade level during academic year 1973-74.

Table I.2

DUMMY CODING OF THE EXOGENOUS VARIABLES USED IN MODELING

Original Variable	Values of Original Variable	First Dummy Variable	Values of First Dummy Variable	Second Dummy Variable	Values of Second Dummy Variable
UB Participation Pattern	0 = Nonparticipant 1 = Atypical Participant 2 = Typical Participant	UBTYP	0 0 1	UBATYP	0 1 0
Grade Cohort	1 = 10th Grade 2 = 11th Grade 3 = 12th Grade	GR10	1 0 0	GR12	0 0 1
Sex	1 = Male 2 = Female	SEX	0 1		
Academic Risk	1 = Academic Risk 2 = Not Risk	RISK	1 0		
Race	1 = Black 2 = White 3 = Other	RABL	1 0 0	RAOTH	0 0 1
Poverty Status	1 = Poverty Level 2 = Not Poverty Level	POVS	1 0		

NOTE: The dummy variables correspond to the values of the original variables given on the same lines.

as indicated in Table I.3. The host status variables represent a recoding in which non-host institutions were the base group; the remaining three variables were considered to represent scaled values. It should be recognized that, while the constructs underlying selectivity and size may be represented on continuous interval scales, the actual variables used are transformations of the scales that preserve only the order. The level-of-offering variable has, at best, only ordinal scale properties. Three support service use variables were considered, representing extent of using services within the three general support areas of tutoring, counseling, and remedial services. Each of these variables was scaled as indicated in Table I.4, but these scales also have only ordinal properties.

Four meaures of financial aid were considered: receipt of grants or scholarships (GRNTR), (2) receipt of loans (LOANR), (3) use of earnings or savings (SWORKR), and (4) scaled amount of grants/scholarhips received (GRTCAT). The first three variables resulted from a recoding with nonreceipt representing the base group. The final measure represents a five-valued scaling of total amount of grant/scholarship funds received, as adjusted by the cost of the institution last attended. Preliminary trimming of the grant/scholarhip amount variable is shown in Tables I.5 and the scaling of GRTCAT for values other than zero is defined in Table I.6. The final scale has only ordinal properties.

Three PSE success outcomes were considered: (1) a persistence measure, number of terms of attending PSE (NOTRM), (2) a performance measure, overall GPA at instituion last attended (TOTGPA), and (3) a progress measure, total termwise credits earned (RTCRED). These variables are considered to represent interval or ratio scales. The first variable is scaled as a whole number from 0 to 25; the second variable is continuous from 0.0 to 4.0. The last variable is a rescaling of total credits earned by dividing by 15 (the number of credits needed per term to progress normally in student class), which maintains the ratio scale property of the variable.

D. Solution Strategies

The solution of the model was not completely straightforward. Cost considerations necessitated implementing a stagewise solution using some preliminary modeling, rather than a simultaneous solution for all potential model parameters. Additionally, the nondirectional relationships among variables within certain endogenous variable sets posed a very real problem in the computation of indirect effects; thus, alternate strategies were implemented to estimate these effects. The particular strategies used are detailed below.

1. Preliminary Modeling

The full model proposed involved 9 exogenous variables and 14 endogenous variables. With the adopted specification of the model, a completely unconstrained solution would have involved estimating 231 free parameters for the case without measurement error and additional free parameters in the estimated measurement error case. The estimation procedure for the LISREL program is quite efficient for moderate-sized problems, using a sequential application of steepest descent and Fletcher-Powell algorithms. For larger problems, the solution time increases geometricaly with additional variables. Moreover, in extreme cases it is possible that convergence will not obtain

Table I.3

SCALING OF THE INSTITUTIONAL CHARACTERISTICS VARIABLES USED IN MODELING

Variable	Categories	Scale Value
IOFF (Institutional level of offering)	Vocational/technical/business	-1
	Two-year college	0
	Four-year college or university	1
ISIZ (Undergraduate student enrollment)	Less than 500	-2
	500-2,499	-1
	2,500-7,499	0
	7,500-14,999	1
	15,000 or more	2
ISEL (Relative institutional selectivity)	Low	-1
	Intermediate	0
	High	1
UBHOST (UB Host status of institution 1974-1978)	Not host	0
	Host	1
SSHOST (SSDS host status of institution 1974-78)	Not host	0
	Host	1

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Table I.4

SCALING OF THE SERVICE USE VARIABLES USED IN MODELING: USE OF TUTORING SERVICES (TUSE), USE OF COUNSELING SERVICES (CUSE), AND USE OF REMEDIAL SERVICES (RUSE)

Condition	Scale Value
Not available or did not participate	0
Participated "infrequently"	1
Participated "sometimes"	2
Participated "frequently"	3

Table I.5

TRIMMING EXCESSIVELY HIGH OR LOW VALUES OF AMOUNT OF GRANTS/SCHOLARHIPS RECEIVED

Institutional Costs	Old Value	New Value[a]
Any value	$0	$0
Any value	$1-$10	$0
Any value	$11-$100	$100 + old value
Any value	$101-$5,000	Old value
Less than $500	$5,001 or greater	R{OLD VALUE/10}
$500-$999	$5,001-$10,000	R{OLD VALUE/5}
$500-$999	$10,001 or greater	R{OLD VALUE/10}
$1,000-$1,999	$5,001-$8,000	R{OLD VALUE/2}
$1,000-$1,999	$8,001-$12,000	R{OLD VALUE/3}
$1,000-$1,999	$12,001 or greater	R{OLD VALUE/4}
$2,000-$3,999	$5,001-$7,500	R{OLD VALUE/1.5}
$2,000-$3,999	$7,501-$10,000	R{OLD VALUE/2}
$2,000-$3,999	$10,001 or greater	R{OLD VALUE/3}
$4,000 or more	$5,001 or greater	$4,000 + R{OLD VALUE/10}
Indeterminate	$5,001 or greater	$2,000 + R{OLD VALUE/10}

[a] R{x} = x rounded to nearest integer value.

Table I.6

SCALING OF AMOUNT OF GRANTS RECEIVED

Institutional Cost	Reported Amount of Grants/ Scholarships Received[a]	Scale for GRTCAT
Less than $500	Less than $250	1
	$250-$499	2
	$500-$999	3
	$1,000 or more	4
$500-$999	Less than $500	1
	$500-$999	2
	$1,000-$1,999	3
	$2,000 or more	4
$1,000-$1,999	Less than $1,000	1
	$1,000-$1,999	2
	$2,000-$3,999	3
	$4,000 or more	4
$2,000-$3,999	Less than $2,000	1
	$2,000-$3,999	2
	$4,000-$7,999	3
	$8,000 or more	4
$4,000 or more	Less than $4,000	1
	$4,000-$7,999	2
	$8,000-$15,999	3
	$16,000 or more	4

[a] After trimming (see Table I.5).

within the maximum allowable time for computer usage. It was therefore considered infeasible to attempt a simultaneous solution for all potential free parameters. Rather, a stagewise approach to the model solution was implemented; the approach taken differed somewhat for the case without measurement error and the case with estimated measurement error.

In solving the model without measurement error, some relationships were constrained to zero on theoretical grounds (e.g., grade cohort relationships to institutional context variables) by agreement of RTI and USOE. Additionally, under these constraints, preliminary regression solutions were implemented to detect empirical nonsignificant relationships. Using a stepdown approach, each endogenous variable was examined in relation to all potential exogenous and endogenous variables that could predict it within the general framework of the adopted model. Predictor variables with nonsignificant regression coefficients were removed from the regression solution in a stepwise manner, using the magnitude of the F ratio as the criterion for sequential stepdown. Two or more dummy variables created from the same underlying categorical variable (i.e., grade cohort, UB participation pattern, race) were treated as a class variable. Thus, dummy variables in the same class were eliminated from the regression model only if the prediction of the entire class was nonsignificant. The preliminary regression approach resulted in parsimonious prediction models for each endogenous variable. Only the predictor variables remaining in each of the parsimonious models were considered in the LISREL solution; other variables that had been eliminated on theoretical grounds or through the regression solutions were constrained to values of zero in the matrices Γ and β.

Beyond this, the LISREL solution itself was obtained in a stagewise manner. Due to specific USOE interest, the grant/scholarship receipt variable was considered separately from the full model. Since the rescaled value of amount of grants/scholarship funds received was considered a more meaningful variable for the full model, it was used, along with receipt of loans and use of earnings or savings, in subsequent modeling of the financial aid variable complex and of postsecondary performance, progress, and persistence. Given the need for two model solutions, the simpler model involving grant/scholarship receipt was solved first; that solution yielded solutions for parameters of the relationships among exogenous variables, the set of institutional context variables, and the set of service use variables. These solutions were then used as fixed parameters in the subsequent solution of the full model. In both solutions, iterations were necessary due to the statistical nonsignificance of some coefficients in the first solution. The iterative approach used was analogous to that employed in the preliminary regression approach.

For the model with estimated measurement error, a priori constraints were not introduced, and the preliminary regression approach was not appropriate, since it could not accomodate the differential reliability estimates. In this solution a different stagewise approach was used. The approach was conceptually quite simple, involving a stepwise LISREL solution to each set of variables in the model. First a solution was obtained for the first set of endogenous variables, the institutional context factors. This solution started by allowing all possible relationships as free parameters, and an iterative parsimonious solution was obtained by constraining nonsignificant coefficients to zero in a stepwise manner. The parameters from the parsimonious solution for institutional context (including those that had been constrained to zero) were used as fixed parameters in modeling the next set of endogenous variables, service use. The process was continued until the last set of endogenous variables, PSE success indices, had been included.

2. Alternate Solutions for Indirect Effects

As indicated by the structural equations approach, direct effects of UB participation on the PSE success measures examined can be misleading without consideration of indirect effects through the three intervening variable sets (school type, service use, and financial aid). The numerical value of indirect effect can be obtained through multiplication of appropriate coefficients associated with the indirect paths as indicated in the tables in Section VI of this appendix. As indicated earlier, however, those coefficients do not reflect the additional indirect effects operating through the nondirectional paths among endogenous variables within a particular variable set (for example, the relationships among the service use variables). While such relationships have been allowed in the structural model solution, they are not reflected in the solution for path coefficients reported for the matrices Γ and β.

An alternate approach was therefore used to obtain these indirect effects for the PSE success variables. In general, the approach involved solving a structural model that did not involve the intervening variables, but that did include the background and temporal factors. The unique relationship between typical and atypical UB participation, as obtained through such an alternate solution, reflects the overall relationship between UB participation and the outcome variable of interest. The total indirect relationship was then obtained by subtracting the direct relationship, as indicated in Γ for the full modeling, from the total overall relationship. Moreover, assuming that the relative contribution of school type, service use, and financial aid to the total indirect effect was proportionally equivalent for the alternate solution and the direct solution (obtained through multiplication of the path coefficients), unique contributions of each of these three classes of variable on outcome measures of interest were estimated within the alternate approach.

The solution for the overall effect differed somewhat for the model without error and the model with estimated error. In the former case, solutions were obtained using a multiple regression approach, but in the latter case, in which it was necessary to account for differential reliability, a separate LISREL solution was obtained. The two solutions for overall effects are given in Section VI, Tables I.23 and I.24. Additional computations of indirect effects through the alternate approach are provided in Tables I.26 through I.31.

V. CONSTRAINTS AND LIMITATIONS OF ANALYSES

The relational analyses are subject to some of the same constraints and limitations as the comparative/descriptive analyses, as well as several others. The potential problems of sampling error and bias remain, as do other constraints involving data validity and interpretation (see Section II of Appendix H). Additional limitations associated specifically with the relational analyses can be classified into two areas: (a) limitations of the technique per se and (b) limitations specific to the use of the technique within the current study. Limitations of the first type are inherent in assumptions that underly the procedure, while limitations of the second type concern additional assumptions made in current use of the procedure.

A. Limitations of the Technique

The structural equations approach assumes a model that has been developed and, thus, is subject to errors in specification of that model. While tests are available to determine if the model provides a reasonable fit to the data, no tests are available to determine if the adopted model provides a "best fit." Moreover, all estimates produced from the analysis are completely conditional on the model that has been assumed (different models could produce different estimates). Consequently, results are considerably assumption-bound.

The major constraining assumptions are: (1) all relevant variables have been incorporated into the model, and (2) the model has been correctly specified. If these assumptions are met, then results are theoretically sound. There is no assurance, however, that the assumptions are valid; in fact, there is some indication in the results that some of the directional relationships in the model are misspecified. As an example, the relationships of the service use variables to grade point average are negative. Theoretically, the use of tutoring services by needy individuals should increase grade point average; a similar relationship would be expected for use of remedial services, but the theoretical argument assumes an interaction of extent of service use and need for use of that service. Need for services was not measured directly and interaction terms were not included in the structural model under consideration. The solution may reflect, therefore, that compared to individuals who do not need tutoring (or remedial) services, those who have lower grade point averages need (and therefore use) such services to a greater extent (a misspecification of directionality).

An additional limitation, indicated above, is that the procedure used is not amenable to consideration of interactions and is most interpretable under the assumption of a strictly additive model. While strict additivity of main effects is a convenient assumption, it is not one that is typically based in reality. There was some evidence in results of some preliminary analyses, not included in the report, that interactions among the variables used for prediction was, in fact, present. The assumption of a multivariate normal distribution of variables is rarely, if ever, accurate.

B. Additional Study-Specific Limitations

In general, the LISREL procedure was less than ideally suited to its application in this study. While the procedure used can be forced to accomodate unequally weighted data elements, it is not particularly suited to stratified cluster samples such as the one available in this study. In particular, the standard error estimates provided by the procedure do not incorporate the design effect reflecting stratification and clustering. The additional assumptions made in calculating analysis weights that were unrelated to sampling probabilities (see Appendix G) further restricted both the meaningfulness and generalizabilty of results. Beyond the weighting assumptions, only individuals with complete data sets were considered in these analyses, which is an implicit assumption of randomness of nonresponse. While such an assumption is convenient, it cannot be supported on theoretical or empirical grounds. As a net result of these procedures, results are applicable only to the specific sample and within that sample only to the specific subset of respondents with available data. For these reasons, results do not necessarily generalize to any well-defined larger population, and the analyses can only be viewed as exploratory.

As indicated in Section IV, some of the analytic variables used do not have the interval scale properties required by the analytic approach. Consequently, the solutions must be viewed as much more tentative than would be desirable. Moreover. the stagewise solutions described in Section IV, while required by budgetary constraints, introduce a rather large potential for errors in the results. Neither the estimated parameters of the final solution nor their associated standard errors are necessarily the estimates that would have been obtained had the solution for all parameters been obtained simultaneously.

VI. TABULAR SUMMARY OF RESULTS

Solutions of the various models examined are summarized in tabular form in this section. Resulting estimates and associated standard errors for models without measurement error (a model for receipt or nonreceipt of grants/scholarhips and the full model) are given in Tables I.7 through I.13. Analogous results for models with estimated measurement error are given in Tables I.14 through I.22. Tables I.23, I.24, and I.26 through I.31 provide information regarding alternate computations of indirect effects. The results of tests for goodness of fit for all models examined are provided in Table I.25.

A word of caution is in order with respect to the interpretation of the test of fit of a model. In this situation, the null hypothesis is that there is no lack of fit of the model to the data. Thus, rejection of the null hypothesis as a result of a statistically significant chi-square value implies that the model does not perfectly reproduce the variance-covariance matrix which served as the input. In exploratory studies of the type reported here, this is not a serious issue. Rather, the goal is to balance the extent to which the data can be predicted from the model with the number of parameters employed. The chi-square value incorporates the number of cases in its numerator. Thus, when dealing with large sample sizes, relatively small discrepancies between the observed and predicted variance-covariance matrix tend to yield statistically significant chi-square values. In these instances, the sensitivity of the test to departure from the null hypothesis tends to eclipse the practical significance of those departures. For these reasons, the fact that all structural equation models yield predicted variance-covariance matrices that are statistically different from the observed matrices is not seen to be an important problem.

Table I.7

VALUES OF THE MATRIX Φ FOR ALL MODELING WITHOUT MEASUREMENT ERROR

	UBTYP	UBATYP	GR10	GR12	SEX	RISK	RABL	RAOTH	POVS
UBTYP	0.209								
UBATYP	-0.035	0.105							
GR10	-0.002	0.003	0.099						
GR12	0.003	-0.003	-0.054	0.250					
SEX	-0.015	-0.002	-0.004	0.016	0.239				
RISK	-0.016	-0.009	-0.001	-0.023	-0.029	0.244			
RABL	-0.003	-0.019	0.006	0.012	0.022	0.016	0.197		
RAOTH	-0.001	0.004	-0.003	-0.010	-0.016	0.001	-0.120	0.137	
POVS	-0.012	-0.021	-0.003	-0.004	0.011	0.008	0.026	-0.002	0.157

NOTE: All of the parameters in this matrix were fixed equal to their observed and/or independently estimated values. No standard errors are provided. Only the lower triangular portion of this symmetric matrix is presented.

Table I.8

SOLUTION FOR THE MATRIX Γ FOR MODELING GRANT RECEIPT WITHOUT MEASUREMENT ERROR

Prediction Equation For	Predictor								
	UBTYP	UBATYP	GR10	GR12	SEX	RISK	RABL	RAOTH	POVS
IOFF	0.345 (0.036)	0.172 (0.051)	0.0 (0.0)	0.0 (0.0)	-0.129 (0.028)	-0.128 (0.028)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
ISIZ	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.030 (0.103)	0.492 (0.122)	-0.285 (0.081)
ISEL	0.129 (0.043)	0.079 (0.062)	0.0 (0.0)	0.0 (0.0)	-0.146 (0.039)	-0.128 (0.039)	-0.293 (0.061)	-0.011 (0.072)	-0.090 (0.048)
UBHOST	0.202 (0.031)	0.020 (0.044)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.113 (0.031)
SSHOST	0.052 (0.031)	-0.029 (0.044)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.050 (0.026)	0.0 (0.0)	0.0 (0.0)	0.080 (0.034)
TUSE	0.206 (0.069)	0.188 (0.097)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.461 (0.100)	0.306 (0.119)	0.0 (0.0)
RUSE	0.122 (0.061)	0.106 (0.087)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.231 (0.049)	0.485 (0.090)	0.269 (0.106)	0.0 (0.0)
CUSE	0.141 (0.051)	0.156 (0.074)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.305 (0.076)	0.138 (0.091)	0.0 (0.0)
GRNTR	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.113 (0.19)	0.109 (0.032)	0.090 (0.038)	0.139 (0.025)

NOTE: Cell entries are the coefficients (no parentheses) and standard errors of the coefficients (in parentheses). Coefficient values of zero were constrained to that value based on the result of preliminary regression solutions and/or preliminary solutions to the model.

Table I.9

SOLUTION FOR THE MATRIX β FOR MODELING GRANT RECEIPT WITHOUT MEASUREMENT ERROR

Prediction Equation For	Predictor								
	IOFF	ISIZ	ISEL	UBHOST	SSHOST	TUSE	RUSE	CUSE	GRNTR
IOFF	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
ISIZ	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
ISEL	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
UBHOST	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
SSHOST	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
TUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	-0.245 (0.060)	0.147 (0.062)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
RUSE	0.0 (0.0)	0.0 (0.0)	0.127 (0.033)	0.0 (0.0)	0.180 (0.050)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)
CUSE	0.0 (0.0)	0.072 (0.018)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)
GRNTR	-0.061 (0.020)	0.040 (0.009)	-0.058 (0.015)	-0.070 (0.023)	0.056 (0.021)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)

NOTE: Cell entries are the coefficients (no parentheses) and standard error of the coefficients (in parentheses). Some coefficient values of zero in the lower triangular portion of the matrix were constrained to that value based on the result of preliminary regression solutions and/or preliminary solutions to the model. Diagonal elements are not part of the prediction equation. The upper triangular elements of the matrix, as well as lower triangular elements representing a crossing of variables within the same variable set (e.g., service use variables), are constrained to zero by the nature of the model. Signs of the coefficients in β are the reverse of those in the structural equation model.

Table I.10

SOLUTION FOR THE MATRIX Ψ FOR MODELING GRANT RECEIPT WITHOUT MEASUREMENT ERROR

	IOFF	ISIZ	ISEL	UBHOST	SSHOST	TUSE	RUSE	CUSE	GRNTR
IOFF	0.360 (0.014)								
ISIZ	0.198 (0.020)	1.389 (0.055)							
ISEL	0.181 (0.013)	0.303 (0.025)	0.524 (0.021)						
UBHOST	0.144 (0.009)	0.012 (0.016)	0.035 (0.010)	0.239 (0.009)					
SSHOST	0.091 (0.009)	0.126 (0.017)	0.006 (0.010)	0.081 (0.007)	0.246 (0.010)				
TUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.165 (0.046)			
RUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.355 (0.030)	0.923 (0.036)		
CUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.219 (0.025)	0.292 (0.023)	0.671 (0.026)	
GRNTR	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.116 (0.005)

NOTE: Cell entries are the residual variance/covariances among the endogenous variables (no parenthesis) and the standard errors of these estimates (in parentheses). Values of zero were constrained to that value on theoretical grounds. Only the lower triangular portion of this symmetric matrix is presented.

Table I.11

SOLUTION FOR THE MATRIX Γ FOR MODELING NUMBER OF TERMS, TOTAL CREDITS EARNED AND OVERALL GPA WITHOUT MEASUREMENT ERROR

Prediction Equation For	Predictor								
	UBTYP	UBATYP	GR10	GR12	SEX	RISK	RABL	RAOTH	POVS
IOFF	0.345 (0.036)	0.172 (0.051)	0.0 (0.0)	0.0 (0.0)	-0.129 (0.028)	-0.128 (0.028)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
ISIZ	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.030 (0.103)	0.492 (0.122)	-0.285 (0.081)
ISEL	0.129 (0.043)	0.079 (0.062)	0.0 (0.0)	0.0 (0.0)	-0.146 (0.039)	-0.128 (0.039)	-0.293 (0.061)	-0.011 (0.072)	-0.090 (0.048)
UBHOST	0.202 (0.031)	0.020 (0.044)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.113 (0.031)
SSHOST	0.052 (0.031)	-0.029 (0.044)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.050 (0.026)	0.0 (0.0)	0.0 (0.0)	0.080 (0.034)
TUSE	0.206 (0.069)	0.188 (0.097)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.461 (0.100)	0.306 (0.119)	0.0 (0.0)
RUSE	0.122 (0.061)	0.106 (0.087)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.231 (0.049)	0.485 (0.090)	0.269 (0.106)	0.0 (0.0)
CUSE	0.141 (0.51)	0.156 (0.074)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.305 (0.076)	0.138 (0.091)	0.0 (0.0)
GRTCAT	0.0 (0.0)	0.0 (0.0)	0.261 (0.120)	-0.138 (0.076)	0.0 (0.0)	0.170 (0.073)	0.155 (0.120)	0.521 (0.141)	0.484 (0.091)
LOANR	0.136 (0.029)	0.093 (0.040)	-0.042 (0.042)	0.050 (0.026)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
SWORKR	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	-0.171 (0.027)	-0.080 (0.027)	-0.178 (0.043)	-0.083 (0.051)	0.0 (0.0)
NOTRM	0.0 (0.0)	0.0 (0.0)	-2.529 (0.290)	1.200 (0.183)	0.0 (0.0)	-1.485 (0.185)	1.949 (0.303)	1.006 (0.357)	-0.586 (0.233)
RTCRED	-0.679 (0.148)	-0.414 (0.205)	-1.900 (0.274)	0.824 (0.173)	0.0 (0.0)	-2.042 (0.185)	0.847 (0.307)	-0.220 (0.360)	-0.523 (0.236)
TOTGPA	-0.200 (0.046)	-0.269 (0.065)	0.0 (0.0)	0.0 (0.0)	0.117 (0.039)	-0.410 (0.043)	-0.203 (0.071)	-0.239 (0.083)	-0.121 (0.055)

NOTE: Cell entries are the coefficients (no parentheses) and standard errors of the coefficients (in parentheses Coefficient values of zero were constrained to that value based on the result of preliminary regression solutions and/or preliminary solutions to the model. Since the model was estimated in a stagewise manner, the asymptotic standard errors were drawn from the separate estimation stages and are not, necessarily, equal to those that woul be produced had the entire model been estimated simultaneously.

Table I.12

SOLUTION FOR THE MATRIX β FOR MODELING NUMBER OF TERMS, TOTAL CREDITS EARNED AND OVERALL GPA WITHOUT MEASUREMENT ERROR

Prediction Equation for	Predictor													
	IOFF	ISIZ	ISEL	UBHOST	SSHOST	TUSE	RUSE	CUSE	GRTCAT	LOANR	SWORKR	NOTRM	RTCRED	TOTGPA
IOFF	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
ISIZ	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
ISEL	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
UBHOST	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
SSHOST	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
TUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	-0.245 (0.060)	0.147 (0.062)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
RUSE	0.0 (0.0)	0.0 (0.0)	0.127 (0.033)	0.0 (0.0)	0.180 (0.050)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
CUSE	0.0 (0.0)	0.072 (0.018)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
GRTCAT	0.0 (0.0)	0.0 (0.0)	-0.233 (0.049)	-0.398 (0.071)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
LOANR	-0.042 (0.023)	0.068 (0.011)	-0.116 (0.019)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	-0.047 (0.015)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
SWORKR	-0.092 (0.025)	0.0 (0.0)	0.0 (0.0)	0.107 (0.031)	-0.079 (0.028)	0.0 (0.0)	0.0 (0.0)	-0.060 (0.016)	0.033 (0.010)	-0.199 (0.028)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
NOTRM	-2.188 (0.147)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.995 (0.181)	-0.196 (0.058)	0.0 (0.0)	0.0 (0.0)	-0.481 (0.069)	0.0 (0.0)	-0.944 (0.184)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)
RTCRED	-2.502 (0.159)	0.334 (0.059)	-0.276 (0.095)	-0.583 (0.151)	0.605 (0.175)	0.0 (0.0)	0.0 (0.0)	0.311 (0.073)	-0.682 (0.070)	-0.412 (0.142)	-0.794 (0.187)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)
TOTGPA	0.0 (0.0)	0.100 (0.017)	0.0 (0.0)	-0.130 (0.041)	0.0 (0.0)	0.039 (0.018)	0.106 (0.020)	0.0 (0.0)	-0.052 (0.016)	-0.082 (0.044)	-0.177 (0.044)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)

NOTE: Cell entries are the coefficients (no parentheses) and standard error of the coefficients (in parentheses). Some coefficient values of zero in the lower triangular portion of the matrix were constrained to that value based on the result of preliminary regression solutions and/or preliminary solutions to the model. Diagonal elements are not part of the prediction equation. The upper triangular elements of the matrix, as well as lower triangular elements representing a crossing of variables within the same variable set (e.g., service use variables), are constrained to zero by the nature of the model. Signs of the coefficients in β are the reverse of those in the structural equation model. Since the model was estimated in a stagewise manner, the asymptotic standard errors were drawn from the separate estimation stages and are not, necessarily, equal to those that would be produced had the entire model been estimated simultaneously.

Table I.13

SOLUTION FOR THE MATRIX Ψ FOR MODELING NUMBER OF TERMS, TOTAL CREDITS EARNED AND OVERALL GPA WITHOUT MEASUREMENT ERROR

	IOFF	ISIZ	ISEL	UBHOST	SSHOST	TUSE	RUSE	CUSE	GRTCAT	LOANR	SWORKR	NOTRM	RTCRED	TOTGPA
IOFF	0.360 (0.014)													
ISIZ	0.198 (0.020)	1.389 (0.055)												
ISEL	0.181 (0.013)	0.303 (0.025)	0.524 (0.021)											
UBHOST	0.144 (0.009)	0.012 (0.016)	0.035 (0.010)	0.239 (0.009)										
SSHOST	0.091 (0.009)	0.126 (0.017)	0.006 (0.010)	0.081 (0.007)	0.246 (0.010)									
TUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.165 (0.046)								
RUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.355 (0.030)	0.923 (0.036)							
CUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.219 (0.025)	0.292 (0.023)	0.671 (0.026)						
GRTCAT	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.609 (0.063)					
LOANR	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.197 (0.008)				
SWORKR	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.212 (0.008)			
NOTRM	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	10.232 (0.403)		
RTCRED	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	7.403 (0.352)	10.304 (0.405)	
TOTGPA	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.693 (0.068)	1.040 (0.072)	0.544 (0.021)

NOTE: Cell entries are the residual variance/covariances among the endogenous variables (no parenthesis) and the standard errors of these estimates (in parentheses). Values of zero were constrained to that value on theoretical grounds. Only the lower triangular portion of this symmetric matrix is presented. Since the model was estimated in a stagewise manner, the asymptotic standard errors were drawn from the separate estimation stages and are not, necessarily, equal to those that would be produced had the entire model been estimated simultaneously.

Table 1.14

VALUES OF THE MATRIX Φ FOR ALL MODELING WITH ESTIMATED MEASUREMENT ERROR

	UBTYP	UBATYP	GR10	GR12	SEX	RISK	RABL	RAOTH	POVS
UBTYP	0.167								
UBATYP	-0.035	0.084							
GR10	-0.002	0.003	0.089						
GR12	0.003	-0.003	-0.054	0.225					
SEX	-0.015	-0.002	-0.004	0.016	0.227				
RISK	-0.016	-0.009	-0.001	-0.023	-0.029	0.220			
RABL	-0.003	-0.019	0.006	0.012	0.022	0.016	0.177		
RAOTH	-0.001	0.004	-0.003	-0.010	-0.016	0.001	-0.120	0.123	
POVS	-0.012	-0.021	-0.003	-0.004	0.011	0.008	0.026	-0.002	0.110

NOTE: All of the parameters in this matrix were equal to their observed and/or independently estimated values. No standard errors are provided. Only the lower triangular portion of this symmetric matrix is presented.

Table I.15

SOLUTION FOR THE MATRIX Γ
FOR MODELING GRANT RECEIPT WITH ESTIMATED MEASUREMENT ERROR

Prediction Equation for	Predictor								
	UBTYP	UBATYP	GR10	GR12	SEX	RISK	RABL	RAOTH	POVS
IOFF	0.434 (0.049)	0.270 (0.065)	0.0 (0.0)	0.0 (0.0)	-0.125 (0.031)	-0.140 (0.032)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
ISIZ	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.266 (0.174)	0.872 (0.205)	-0.434 (0.117)
ISEL	0.179 (0.057)	0.118 (0.081)	-0.168 (0.068)	-0.010 (0.043)	-0.165 (0.042)	-0.122 (0.044)	-0.473 (0.100)	-0.277 (0.117)	0.0 (0.0)
UBHOST	0.242 (0.039)	0.069 (0.055)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.152 (0.044)
SSHOST	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.062 (0.027)	0.0 (0.0)	0.228 (0.066)	0.443 (0.080)	0.0 (0.0)
TUSE	0.239 (0.086)	0.256 (0.122)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.714 (0.163)	0.592 (0.194)	0.0 (0.0)
RUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.257 (0.056)	0.759 (0.142)	0.546 (0.171)	0.0 (0.0)
CUSE	0.148 (0.063)	0.189 (0.091)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.465 (0.122)	0.319 (0.145)	0.0 (0.0)
GRNTR	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.124 (0.022)	0.220 (0.058)	0.197 (0.067)	0.163 (0.038)

NOTE: Cell entries are the coefficients (no parentheses) and standard errors of the coefficients (in parentheses). Coefficient values of zero were constrained to that value based on the result of preliminary solutions to the model. Since the model was estimated in a stagewise manner, the asymptotic standard errors were drawn from the separate estimation stages and are not, necessarily, equal to those that would be produced had the entire model been estimated simultaneously.

Table I.16

SOLUTION FOR THE MATRIX β FOR MODELING GRANT RECEIPT WITH ESTIMATED MEASUREMENT ERROR

Prediction Equation For	Predictor								
	IOFF	ISIZ	ISEL	UBHOST	SSHOST	TUSE	RUSE	CUSE	GRNTR
IOFF	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
ISIZ	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
ISEL	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
UBHOST	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
SSHOST	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
TUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	-0.246 (0.062)	0.164 (0.064)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
RUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.199 (0.052)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)
CUSE	0.0 (0.0)	0.079 (0.022)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)
GRNTR	0.0 (0.0)	0.085 (0.014)	-0.195 (0.029)	-0.068 (0.020)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)

NOTE: Cell entries are the coefficients (no parentheses) and standard error of the coefficients (in parentheses). Some coefficient values of zero in the lower triangular portion of the matrix were constrained to that value based on the result of preliminary solutions to the model. Diagonal elements are not part of the prediction equation. The upper triangular elements of the matrix, as well as lower triangular elements representing a crossing of variables within the same variable set (e.g., service usage variables) are constrained to zero by the nature of the model. Signs of the coefficients in β are the reverse of those in the structural equation model. Since the model was estimated in a stagewise manner the asymptotic standard errors were drawn from the separate estimation stages and are not, necessarily, equal to those that would be produced had the entire model been estimated simultaneously.

Table I.17

SOLUTION FOR THE MATRIX Ψ FOR MODELING GRANT RECEIPT WITH ESTIMATED MEASUREMENT ERROR

	IOFF	ISIZ	ISEL	UBHOST	SSHOST	TUSE	RUSE	CUSE	GRNTR
IOFF	0.292 (0.014)								
ISIZ	0.198 (0.020)	1.087 (0.055)							
ISEL	0.176 (0.013)	0.306 (0.025)	0.289 (0.020)						
UBHOST	0.141 (0.009)	0.015 (0.016)	0.032 (0.010)	0.234 (0.009)					
SSHOST	0.093 (0.009	0.120 (0.016)	0.009 (0.010)	0.083 (0.007)	0.237 (0.010)				
TUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.790 (0.046)			
RUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.350 (0.031)	0.628 (0.037)		
CUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.211 (0.025)	0.289 (0.024)	0.457 (0.026)	
GRNTR	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.071 (0.005)

NOTE: Cell entries are the residual variance/covariances among the endogenous variables (no parentheses) and the standard errors of these estimates (in parentheses). Values of zero were constrained to that value on theoretical grounds. Only the lower triangular portion of this symmetric matrix is presented. Since the model was estimated in a stagewise manner the asymptotic standard errors were drawn from the separate estimation stages and are not necessarily equal to those that would be produced had the entire model been estimated simultaneously.

Table I.18

SOLUTION FOR THE MATRICES Θ_{ε} AND Θ_{ω} FOR MODELING GRANT RECEIPT WITH ESTIMATED MEASUREMENT ERROR

Matrix	Measurement Error for Variable Indicated								
	IOFF	ISIZ	ISES	UBHOST	SSHOST	TUSE	RUSE	CUSE	GRNTR
Θ_{ε} a/	0.059	0.289	0.225	0.002	0.002	0.363	0.297	0.209	0.039
	Measurement Error for Variable Indicated								
	UBTYP	UBATYP	GR10	GR12	SEX	RISK	RABL	RAOTH	POVS
Θ_{ω} b/	0.043 (0.007)	0.021 (0.004)	0.010 (0.003)	0.025 (0.009)	0.012 (0.009)	0.025 (0.009)	0.021 (0.004)	0.015 (0.003)	0.046 (0.006)

NOTE: Only the diagonal elements of these diagonal matrices are given.

a/ All of the parameters in this matrix were equal to their observed and/or independently estimated values. No standard errors are provided.

b/ Values in parentheses represent standard errors of the estimates. Since the model was estimated in a stagewise procedure the asymptotic standard errors were drawn from the separate estimation stages and are not, necessarily, equal to those that would be produced had the entire model been estimated simultaneously.

Table I.19

SOLUTION FOR THE MATRIX Γ FOR MODELING NUMBER OF TERMS, TOTAL CREDITS EARNED, AND OVERALL GPA WITH ESTIMATED MEASUREMENT ERROR

Prediction Equation For	Predictor								
	UBTYP	UBATYP	GR10	GR12	SEX	RISK	RABL	RAOTH	POVS
IOFF	0.434 (0.049)	0.270 (0.065)	0.0 (0.0)	0.0 (0.0)	-0.125 (0.031)	-0.140 (0.032)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
ISIZ	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.266 (0.174)	0.872 (0.205)	-0.434 (0.117)
ISEL	0.179 (0.057)	0.118 (0.081)	-0.168 (0.068)	-0.010 (0.043)	-0.165 (0.042)	-0.122 (0.044)	-0.473 (0.100)	-0.277 (0.117)	0.0 (0.0)
UBHOST	0.242 (0.039)	0.069 (0.055)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.152 (0.044)
SSHOST	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.062 (0.027)	0.0 (0.0)	0.228 (0.066)	0.443 (0.080)	0.0 (0.0)
TUSE	0.239 (0.086)	0.256 (0.122)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.714 (0.163)	0.592 (0.194)	0.0 (0.0)
RUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.257 (0.056)	0.759 (0.142)	0.546 (0.171)	0.0 (0.0)
CUSE	0.148 (0.063)	0.189 (0.091)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.465 (0.122)	0.319 (0.145)	0.0 (0.0)
GRTCAT	0.0 (0.0)	0.0 (0.0)	0.325 (0.140)	-0.137 (0.088)	0.0 (0.0)	0.193 (0.083)	0.330 (0.204)	0.722 (0.233)	0.679 (0.141)
LOANR	0.160 (0.038)	0.094 (0.052)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
SWORKR	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	-0.174 (0.029)	-0.079 (0.031)	-0.229 (0.071)	-0.155 (0.086)	0.0 (0.0)
NOTRM	0.0 (0.0)	0.0 (0.0)	-2.871 (0.356)	1.256 (0.222)	0.0 (0.0)	-1.681 (0.220)	3.318 (0.537)	2.301 (0.620)	-1.096 (0.364)
RTCRED	-1.073 (0.210)	-0.825 (0.284)	-2.231 (0.329)	0.852 (0.205)	0.331 (0.145)	-2.224 (0.230)	1.238 (0.534)	0.071 (0.621)	-1.062 (0.372)
TOTGPA	-0.300 (0.063)	-0.446 (0.090)	0.0 (0.0)	0.0 (0.0)	0.152 (0.046)	-0.422 (0.052)	-0.353 (0.124)	-0.432 (0.143)	-0.198 (0.087)

NOTE: Cell entries are the coefficients (no parentheses) and standard errors of the coefficients (in parentheses). Coefficient values of zero were constrained to that value based on the result of preliminary solutions to the model Since the model was estimated in a stagewise manner the asymptotic standard errors were drawn from the separate estimation stages and are not, necessarily, equal to those that would be produced had the entire model been estimated simultaneously.

Table I.20

SOLUTION FOR THE MATRIX β FOR MODELING NUMBER OF TERMS, TOTAL CREDITS EARNED, AND OVERALL GPA WITH ESTIMATED MEASUREMENT ERROR

Prediction Equation For	Predictor													
	IOFF	ISIZ	ISEL	UBHOST	SSHOST	TUSE	RUSE	CUSE	GRTCAT	LOANR	SWORKR	NOTRM	RTCRED	TOTGPA
IOFF	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
ISIZ	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
ISEL	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
UBHOST	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
SSHOST	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
TUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	-0.248 (0.062)	0.164 (0.064)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
RUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.199 (0.052)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
CUSE	0.0 (0.0)	0.079 (0.022)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
GRTCAT	0.0 (0.0)	0.0 (0.0)	-0.401 (0.079)	-0.362 (0.074)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)	0.00 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
LOANR	0.0 (0.0)	0.111 (0.017)	-0.240 (0.034)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.079 (0.023)	-0.122 (0.029)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
SWORKR	-0.080 (0.036)	-0.039 (0.016)	0.0 (0.0)	0.081 (0.035)	-0.067 (0.030)	0.060 (0.019)	0.0 (0.0)	-0.112 (0.026)	0.049 (0.015)	-0.285 (0.043)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
NOTRM	-2.649 (0.205)	0.0 (0.0)	0.0 (0.0)	0.438 (0.169)	1.159 (0.193)	-0.223 (0.089)	0.0 (0.0)	0.0 (0.0)	-0.723 (0.110)	0.0 (0.0)	-1.410 (0.278)	1.000 (0.0)	0.0 (0.0)	0.0 (0.0)
RTCRED	-3.373 (0.192)	0.436 (0.079)	0.0 (0.0)	0.0 (0.0)	0.780 (0.183)	0.0 (0.0)	0.0 (0.0)	0.388 (0.120)	-1.052 (0.110)	-0.512 (0.217)	-1.243 (0.297)	0.0 (0.0)	1.000 (0.0)	0.0 (0.0)
TOTGPA	0.0 (0.0)	0.117 (0.022)	0.0 (0.0)	-0.114 (0.041)	0.0 (0.0)	0.0 (0.0)	0.233 (0.037)	-0.122 (0.047)	-0.093 (0.025)	0.0 (0.0)	-0.269 (0.068)	0.0 (0.0)	0.0 (0.0)	1.000 (0.0)

NOTE: Cell entries are the coefficients (no parentheses) and standard error of the coefficients (in parentheses). Some coefficient values of zero in the lower triangular portion of the matrix were constrained to that value based on the result of preliminary solutions to the model. Diagonal elements are not part of the prediction equation. The upper triangular elements of the matrix, as well as lower triangular elements representing a crossing of variables within the same variable set (e.g., service use variables) are constrained to zero by the nature of the model. Signs of the coefficients in β are the reverse of those in the structural equation model. Since the model was estimated in a stagewise manner the asymptotic standard errors were drawn from the separate estimation stages and are not, necessarily, equal to those that would be produced had the entire model been estimated simultaneously.

Table I.21

SOLUTION FOR THE MATRIX Ψ FOR MODELING NUMBER OF TERMS, TOTAL CREDITS EARNED, AND OVERALL GPA WITH ESTIMATED MEASUREMENT ERROR

	IOFF	ISIZ	ISEL	UBHOST	SSHOST	TUSE	RUSE	CUSE	GRTCAT	LOANR	SWORKR	NOTRM	RTCRED	TOTGPA
IOFF	0.292 (0.014)													
ISIZ	0.198 (0.020)	1.088 (0.055)												
ISEL	0.176 (0.013)	0.306 (0.025)	0.289 (0.020)											
UBHOST	0.141 (0.009)	0.014 (0.016)	0.033 (0.010)	0.234 (0.009)										
SSHOST	0.093 (0.009)	0.119 (0.016)	0.011 (0.010)	0.083 (0.007)	0.237 (0.010)									
TUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.790 (0.046)								
RUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.350 (0.031)	0.628 (0.037)							
CUSE	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.211 (0.025)	0.289 (0.024)	0.457 (0.026)						
GRTCAT	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1.009 (0.064)					
LOANR	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.117 (0.008)				
SWORKR	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.125 (0.008)			
NOTRM	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	4.596 (0.419)		
RTCRED	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	6.421 (0.366)	3.947 (0.422)	
TOTGPA	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.651 (0.070)	0.946 (0.074)	0.311 (0.022)

NOTE: Cell entries are the residual variance/covariances among the endogenous variables (no parenthesis) and the standard errors of these estimates (in parentheses). Values of zero were constrained to that value on theoretical grounds. Only the lower triangular portion of this symmetric matrix is presented. Since the model was estimated in a stagewise manner the asymptotic standard errors were drawn from the separate estimation stages and are not, necessarily, equal to those that would be produced had the entire model been estimated simultaneously.

Table I.22

SOLUTIONS FOR THE MATRICES Θ_ε AND Θ_ω FOR MODELING NUMBER OF TERMS, TOTAL CREDITS EARNED, AND OVERALL GPA WITH ESTIMATED MEASUREMENT ERROR

Matrix	Measurement Error for Variable Indicated													
	IOFF	ISIZ	ISES	UBHOST	SSHOST	TUSE	RUSE	CUSE	GRTCAT	LOANR	SWORKR	NOTRM	RTCRD	TOTGPA
Θ_ε [a]	0.059	0.289	0.225	0.002	0.002	0.363	0.297	0.209	0.533	0.065	0.074	4.651	5.078	0.198

	Measurement Error for Variable Indicated								
	UBTYP	UBATYP	GR10	GR12	SEX	RISK	RABL	RAOTH	POVS
Θ_ω [b]	0.043 (0.007)	0.021 (0.004)	0.010 (0.003)	0.025 (0.009)	0.012 (0.009)	0.027 (0.009)	0.022 (0.004)	0.015 (0.003)	0.047 (0.006)

NOTE: Only the diagonal elements of these diagonal matrices are given.

[a] All of the parameters in this matrix were equal to their observed and/or independently estimated values. No standard errors are provided.

[b] Values in parentheses represent standard errors of the estimates. Since the model was estimated in a stagewise manner the asymptotic standard errors were drawn from the separate estimation stages and are not, necessarily, equal to those that would be produced had the entire model been estimated simultaneously.

Table I.23

REGRESSION SOLUTION FOR OVERALL EFFECT OF UB PARTICIPATION ON SPECIFIED OUTCOMES CONTROLLING FOR BACKGROUND FACTORS

Predictor Variable	Variable Predicted									
	TUSE	RUSE	CUSE	GRNTR	GRTCAT	LOANR	SWORKR	NOTRM	RTCRED	TOTGPA
UBTYP	.2482 (.0690)	.0985 (.0616)	.1579 (.0524)	.0771 (.0222)	.2226 (.0824)	.1720 (.0291)	.0379 (.0305)	1.0747 (.2255)	.6665 (.2412)	-.1343 (.0489)
UBATYP	.1924 (.0993)	.1117 (.0886)	.1815 (.0754)	.0260 (.0320)	.0850 (.1185)	.1116 (.0418)	.0115 (.0439)	.3599 (.3244)	.0487 (.3470)	-.2525 (.6704)

NOTE: Cell entries include (1) regression coefficients (no parentheses) for predicting specified variables, with control for other background factors and (2) standard errors for the regression coefficient (in parentheses).

Table 1.24

SOLUTIONS FOR THE MATRIX Γ FOR MODELING OVERALL EFFECTS OF UB PARTICIPATION ON SPECIFIED OUTCOMES, USING MEASUREMENT ERROR AND WITH CONTROL FOR BACKGROUND FACTORS

Prediction Equation For	Predictor								
	UBTYP	UBATYP	GR10	GR12	SEX	RISK	RABL	RAOTH	POVS
TUSE	0.541 (0.091)	0.760 (0.130)	-0.249 (0.116)	-0.170 (0.073)	0.076 (0.065)	0.022 (0.071)	2.441 (0.158)	2.260 (0.181)	-0.225 (0.108)
RUSE	0.331 (0.080)	0.606 (0.114)	-0.344 (0.103)	-0.202 (0.065)	0.007 (0.058)	0.496 (0.063)	2.549 (0.145)	2.268 (0.164)	-0.410 (0.097)
CUSE	0.362 (0.069)	0.559 (0.099)	-0.145 (0.088)	0.002 (0.056)	0.064 (0.050)	0.177 (0.053)	1.587 (0.120)	1.396 (0.137)	-0.202 (0.081)
GRNTR	0.260 (0.029)	0.360 (0.042)	0.085 (0.037)	0.049 (0.023)	-0.034 (0.021)	0.100 (0.025)	-0.037 (0.056)	-0.055 (0.063)	1.131 (0.032)
GRTCAT	0.806 (0.108)	1.194 (0.154)	0.386 (0.138)	-0.076 (0.087)	-0.093 (0.078)	-0.124 (0.092)	-0.280 (0.205)	0.227 (0.231)	3.911 (0.115)
LOANR	0.254 (0.040)	0.206 (0.056)	-0.071 (0.050)	0.054 (0.032)	-0.040 (0.028)	-0.161 (0.029)	-0.081 (0.068)	-0.105 (0.077)	0.128 (0.044)
SWORKR	0.026 (0.041)	-0.035 (0.058)	-0.049 (0.052)	-0.036 (0.033)	-0.203 (0.030)	-0.279 (0.031)	-0.104 (0.071)	-0.034 (0.081)	-0.275 (0.047)
NOTRM	1.491 (0.298)	1.635 (0.422)	-3.659 (0.398)	0.673 (0.243)	-1.589 (0.213)	-7.638 (0.205)	5.662 (0.546)	4.581 (0.614)	2.511 (0.381)
RTCRED	0.962 (0.313)	1.292 (0.448)	-2.925 (0.410)	0.265 (0.253)	-1.557 (0.224)	-9.329 (0.219)	2.854 (0.595)	1.647 (0.665)	4.611 (0.405)
TOTGPA	-0.213 (0.066)	-0.338 (0.095)	-0.133 (0.085)	-0.033 (0.054)	0.014 (0.048)	-1.070 (0.049)	-0.580 (0.119)	-0.636 (0.135)	0.364 (0.079)

NOTE: Cell entries are the coefficients (no parentheses) and standard errors of the coefficients (in parentheses).

Table I.25

TESTS OF GOODNESS OF FIT OF MODELS EXAMINED

Model	CHI Square	Degrees of Freedom	Probability Level
Model for GRNTR with no error	139.97	56	0.000
Full model with no error	197.88	94[a]	0.000
Model for GRNTR with error	123.88	52[a]	0.000
Full model with error	157.10	89[a]	0.000
Model for only exogenous variables and outcomes	1,140.68	36	0.000

[a] The degrees of freedom associated with the model have been adjusted to reflect the stagewise solution of using previously obtained estimates as fixed parameter values.

Table I.26

ALTERNATE DETERMINATION OF INDIRECT EFFECTS OF UB PARTICIPATION VARIABLES ON NUMBER OF TERMS ATTENDING FOR MODEL WITHOUT MEASUREMENT ERROR

UB Participation	Source of Indirect Effect	Computed Indirect Effect[a]	Standardized Total Computed Indirect Effect	Alternate Determination of Indirect Effect[b]
Typical	Institution Type	.703	.824	(.886)
	Service Use	.049	.057	(.062)
	Financial Aid	.101	.118	(.127)
	Total	.853	1.000	1.075
Atypical	Institution Type	.376	.826	(.298)
	Service Use	.037	.081	(.029)
	Financial Aid	.042	.092	(.033)
	Total	.455	1.000	.360

[a] Determined by multiplication and addition of products of values given in Tables I.11 and I.12.

[b] Total alternate indirect effect obtained by subtracting observed direct effect (Table I.11) from alternately computed overall effect (Table I.23). Indirect effects for each listed source were determined by multiplying the total alternate indirect effect by the associated proportional effect column.

Table I.27

ALTERNATE DETERMINATION OF INDIRECT EFFECTS OF UB PARTICIPATION VARIABLES ON TERMWISE CREDITS EARNED FOR MODEL WITHOUT MEASUREMENT ERROR

UB Participation	Source of Indirect Effect	Computed Indirect Effect[a/]	Standardized Total Computed Indirect Effect	Alternate Determination of Indirect Effect[b/]
Typical	Institution Type	.985	.876	(1.178)
	Service Use	-.044	-.033	(-.053)
	Financial Aid	.185	.164	(.220)
	Total	1.125	1.000	1.345
Atypical	Institution Type	.430	.939	(.435)
	Service Use	-.049	-.107	(-.049)
	Financial Aid	.077	.168	(.077)
	Total	.458	1.000	.463

[a/] Determined by multiplication and addition of products of values given in Tables I.11 and I.12.

[b/] Total alternate indirect effect obtained by subtracting observed direct effect (Table I.11) from alternately computed overall effect (Table I.23). Indirect effects for each listed source were determined by multiplying the total alternate indirect effect by the associated proportional effect column.

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Table I.28

ALTERNATE DETERMINATION OF INDIRECT EFFECTS OF UB PARTICIPATION VARIABLES ON TOTAL GPA FOR MODEL WITHOUT MEASUREMENT ERROR

UB Participation	Source of Indirect Effect	Computed Indirect Effect[a]	Standardized Total Computed Indirect Effect	Alternate Determination of Indirect Effect[b]
Typical	Institution Type	.026	.765	(.050)
	Service Use	-.020	-.588	(-.039)
	Financial Aid	.028	.824	(.055)
	Total	.034	1.000	.066
Atypical	Institution Type	0	.000	(0)
	Service Use	-.001	-.067	(-.001)
	Financial Aid	.016	1.067	(.018)
	Total	.015	1.000	.017

[a] Determined by multiplication and addition of products of values given in Tables I.11 and I.12.

[b] Total alternate indirect effect obtained by subtracting observed direct effect (Table I.11) from alternately computed overall effect (Table I.23). Indirect effects for each listed source were determined by multiplying the total alternate indirect effect by the associated proportional effect column.

Table I.29

ALTERNATE DETERMINATION OF INDIRECT EFFECTS OF UB PARTICIPATION VARIABLES ON NUMBER OF TERMS ATTENDING FOR MODEL WITH ESTIMATED MEASUREMENT ERROR

UB Participation	Source of Indirect Effect	Computed Indirect Effect[a]	Standardized Total Computed Indirect Effect	Alternate Determination of Indirect Effect[b]
Typical	Institution Type	1.044	.795	(1.185)
	Service Use	.054	.041	(.061)
	Financial Aid	.216	.164	(.245)
	Total	1.314	1.000	1.491
Atypical	Institution Type	.715	.872	(1.425)
	Service Use	.057	.070	(.114)
	Financial Aid	.048	.059	(.096)
	Total	.820	1.000	1.635

[a] Determined by multiplication and addition of products of values given in Tables I.19 and I.20.

[b] Total alternate indirect effect obtained by subtracting observed direct effect (Table I.19) from alternately computed overall effect (Table I.24). Indirect effects for each listed source were determined by multiplying the total alternate indirect effect by the associated proportional effect column.

Table I.30

ALTERNATE DETERMINATION OF INDIRECT EFFECTS OF UB PARTICIPATION VARIABLES ON TERMWISE CREDITS EARNED FOR MODEL WITH ESTIMATED MEASUREMENT ERROR

UB Participation	Source of Indirect Effect	Computed Indirect Effect[a]	Standardized Total Computed Indirect Effect	Alternate Determination of Indirect Effect[b]
Typical	Institution Type	1.464	.824	(1.677)
	Service Use	-.057	-.032	(-.064)
	Financial Aid	.370	.208	(.424)
	Total	1.777	1.000	2.035
Atypical	Institution Type	.911	1.021	(2.162)
	Service Use	-.073	-.082	(-.173)
	Financial Aid	.054	.061	(.128)
	Total	.892	1.000	2.117

[a] Determined by multiplication and addition of products of values given in Tables I.19 and I.20.

[b] Total alternate indirect effect obtained by subtracting observed direct effect (Table I.19) from alternately computed overall effect (Table I.24). Indirect effects for each listed source were determined by multiplying the total alternate indirect effect by the associated proportional effect column.

Table I.31

ALTERNATE DETERMINATION OF INDIRECT EFFECTS OF UB PARTICIPATION VARIABLES ON TOTAL GPA FOR MODEL WITH ESTIMATED MEASUREMENT ERROR

UB Participation	Source of Indirect Effect	Computed Indirect Effect[a]	Standardized Total Computed Indirect Effect	Alternate Determination of Indirect Effect[b]
Typical	Institution Type	.028	.350	(.031)
	Service Use	.018	.225	(.019)
	Financial Aid	.034	.425	(.037)
	Total	.080	1.000	.087
Atypical	Institution Type	0	.000	(0)
	Service Use	.023	.719	(.078)
	Financial Aid	.009	.281	(.030)
	Total	.032	1.000	.108

[a] Determined by multiplication and addition of products of values given in Tables I.19 and I.20.

[b] Total alternate indirect effect obtained by subtracting observed direct effect (Table I.19) from alternately computed overall effect (Table I.24). Indirect effects for each listed source were determined by multiplying the total alternate indirect effect by the associated proportional effect column.